THE FISHES OF THE INDO-AUSTRALIAN ARCHIPELAGO

III

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THE FISHES

OF THE

INDO-AUSTRALIAN ARCHIPELAGO

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III

OSTARIOPHYSI: II CYPRINOIDEA, APODES, SYNBRANCHI

with 214 illustrations

BY

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Professor at the University of Amsterdam

ANL

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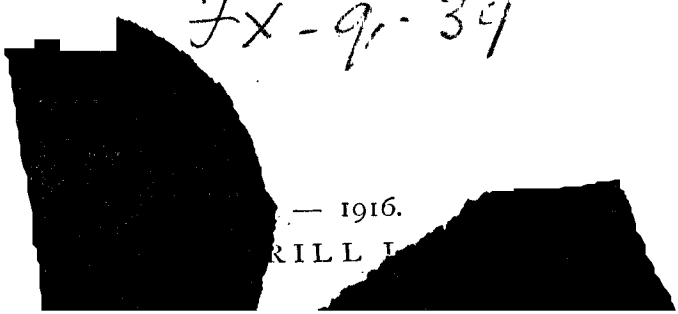

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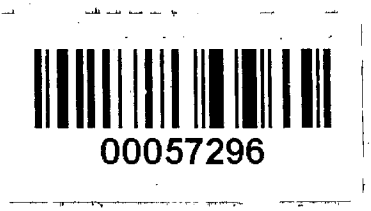

INTRODUCTION.

In continuation of the preceding volume of this series, in which, besides other groups, were treated the *Siluroidea*, as first suborder of the Order *Ostariophysi*, the present or third volume of the "Indo-australian fishes" contains the remaining suborder of the *Ostariophysi*: the *Cyprinoidea* and the Order *Apodes*, to which is added the Order *Synbranchi*.

We refer to the introduction of that preceding volume for the geographical limits of the faunistical region, wherefrom the fishes are here described.

In the quoted introduction we have also made some remarks about the material in general at our disposal. The following may be added for the present volume.

A great part of it, as far as it contains the descriptions of the *Cyprinoidea*, is devoted to fishes living in the fresh water of streams, brooks, ponds and lakes from the western part of the Indo-australian Archipelago, especially from Sumatra, Borneo, Java and neighbouring Islands, reaching eastwards not farther than Borneo and Sumbawa.

The *Synbranchi* and some of the *Apodes* have a wider distribution in the fresh water of the Archipelago.

The remaining *Apodes* are inhabitants of the coral reefs, of the sandy and muddy litoral region, of the brackish water of aestuaries, of the bottom of deeper water, a few even of the true deep sea. Many live below stones, below blocks of coral or find shelter in crevices of rocks or coral reefs, some burrow in sand or mud, while others are met with in surface water.

For the study of the fishes treated in this volume we could dispose of the various collections named in the introduction to the second volume of this series. Since then we received valuable material from Dr. L. PH. DE BUSSY from Deli, from Mr. EDWARD JACOBSON from West-Sumatra (Padangsche Boven- and Beneden-Landen), from Mr. P. BUITENDIJK from the Java Sea, from Mr. G. HERMAN from Sabang, Pulu Weh.

We are glad of the opportunity to thank Dr. J. C. KONINGSBERGER, Director of 's Lands Plantentuin at Buitenzorg, Java, for the great advantage of his collaboration and interest in our work. He allowed us to study all the *Cyprinoidea*, *Apodes* and *Synbranchi* belonging to the Zoological Museum at Buitenzorg and to the "Visscherijstation" at Batavia. Our thanks are therefore also due to Major P. A. OUWENS, keeper of that Museum and to Dr. A. L. J. SUNIER, head of the Station for Fishery Investigation at Batavia, who was kind enough to forward the collection to us and gave us valuable information about its content.

Greatfully we acknowledge the great help we had, in preparing this volume, from the ichthyological material of the Rijks Museum at Leiden. Through the kindness of its Director Dr. E. D. VAN OORT its riches were always at our disposal and by the untiring help of Miss Dr. C. POPTA, we could make use of the types described by herself, by VAILLANT and of some of the types and cotypes of BLEEKER and KAUP.

The bulk of BLEEKER's types of *Cyprinoidea* and *Apodes* is contained in the British Museum (Natural History). One of us had the opportunity to study them: an opportunity without which our work had been insufficient and incomplete. We are therefore glad to thank the Director of the Zoological Department of that Museum, Dr. SYDNEY HARMER and especially Mr. C. TATE REGAN, under whose able superintendance the fish collection is placed, for the valuable and liberal help we always received.

Dr. G. DUNCKER from the Hamburg Museum was kind enough to send us for inspection all the *Cyprinoidea* from the Archipelago, which are under his charge. This important collection was of much help in our study.

We have also to thank Dr. J. PELLEGRIN for very valuable informations about some types preserved in the Muséum d'histoire naturelle at Paris and Dr. R. GESTRO, Director of the Museo Civico of Genova, for some cotypes of species described by PERUGIA.

For the benefit of those who make use of this volume we repeat the technical informations, given in the introduction to the second volume of this series.

In describing the fishes we understand by *Length*, in the

discussions of the proportions, the distance between the snout and the base of the caudal fin; in giving the largest size known for a species, we include the caudal fin.

The *Head* is measured from the tip of the snout to the end of the opercle, its proportion to the length is indicated e.g. as follows: head 4—$4^1/_2$ means, that the length of the head is contained 4 to $4^1/_2$ times in the length.

Height is the maximum height; in special cases it is indicated how it is measured; the figures placed behind "height" indicate how many times it is contained in the length.

The size of the *Eye*, the length of the *Snout*, of the *Jaws* etc. are compared with the length of the head; thus "eye 4" means, that its diameter is $^1/_4$ of the length of the head.

In counting the *Scales*, under "*L. l.*" is given the number of scales, with or without sensory organs, between the head and the caudal fin or, in most cases, between that fin and the upper corner of the opercle.

L. t. $\frac{3^1/_2}{6\,(7)}$ signifies, that there are $3^1/_2$ rows of scales between the dorsal fin and the lateral line and 6 to 7 below it, the lateral line itself is in this case not counted. In other cases the lateral line itself is also counted f. i. *L. t.* $\frac{4^1/_2}{1\quad 1}$ (between D. and V.), which signifies, that there are $4^1/_2$ rows of scales between the dorsal fin and the lateral line, one in the lateral line itself and one between it and the ventral fin.

In the *Fin formulae* the spines and the simple, non-branched rays are generally indicated by a figure, separated by a point from that of the number of the branched rays.

The last soft ray of the dorsal and anal, in case it is cleft to the base and therefore counted as two by some authors (BLEEKER e. g.), is reckoned as one, being supported by a single pterygophore.

The *Gillmembranes* may be totally free from each other and from the isthmus; they may be united, but still remain free from the isthmus; or they may be connected with the isthmus and with each other. When in the last case the posterior border of the united gillmembranes is not quite adnate to the isthmus, there remains a free posterior margin, running as a fold over the isthmus from one gillopening to the other.

The complicated structure of the parts of the *mouth* of many *Cyprinoidea* has found ample discussion, illustrated by figures, in the text.

In describing the *Apodes* their dentition is of great importance. To facilitate its description we have added in many cases a figure of the dentition as it is seen on an impression of the teeth in a bit of plasticine. For this purpose we introduce a thin piece of this material in the opened mouth of the fish, close it and extricate afterwards the piece with some caution from the reopened mouth. In this way often teeth are indicated, which otherwise are difficult to detect.

We follow the law of priority and use the oldest name which can with certainty be made out by the description, belonging to a certain species. Its author is cited as the author of the species and his paper is quoted in the first place.

Mention is further made of all synonyms; besides, we have quoted those papers, which contain a description of the species. If it is a widely spread one, only those papers are quoted, which contain a description of or give some informations — others than those regarding locality only — about Indo-Australian specimens of that species.

According to the international rules of nomenclature we have neglected the generic names, as e.g. those of Swainson, which are not accompanied by a description.

We have recorded under: "nomina indigena" those native names, which seemed to us to be trustworthy. We are of opinion that no great value ought to be attached to them, as the unavoidable series of difficulties is still enlarged by the fact, that the authorities for those names have mostly been European ichthyologists and no linguists.

There remains for us the pleasing duty of expressing our thanks to Mr. C. PELTENBURG, head of the firm E. J. BRILL Ltd of Leiden for the interest he took in publishing also this volume and to Mr. J. F. OBBES, the able artist to whom we are indebted for the faithful figures, which illustrate this volume.

MAX WEBER.
L. F. DE BEAUFORT.

Eerbeek, Holland, July 1916.

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2. Suborder Cyprinoidea.

(Eventognathi Gill).

Skin with cycloid scales, exceptionally naked. Parietals not united with supraoccipital, distinct from each other by median suture or by a fontanel. Mouth more or less protractile, toothless. Maxillaries generally excluded by the intermaxillaries from the border of the mouth. Barbels present or absent. The maxillary barbel not supported by the maxillary as in Siluroidea. No adipose fin. Symplectic and opercular bones all present. Inferior pharyngeal bones falciform, parallel with the branchial arches, armed with mostly large and specialized teeth. Branchiostegals 3. Pseudobranchiae nearly always present. Anterior vertebrae more or less distinct. Ribs mostly sessile. No parapophyses in the thoracic region. Rays of fins articulated, the segments of the second and third dorsal ray may coossify and form a spine consisting of two coossified halves. None of the pectoral rays are ossified. Lateral line nearly always present and complete.

Key to the indo-australian families of the suborder of Cyprinoidea.

1. Pectoral and ventral fins horizontally inserted, the former generally with several of their outer and sometimes of their inner rays simple. No movable spine before or below eye. At least 6 barbels. . . . . *Homalopteridae* p. 2.
2. Pectoral and ventral fins not horizontally inserted, only one of their outer rays simple.
   a. A simple or bifid movable spine may be present before or below eye, which has a free orbital margin or is covered by skin. Mouth inferior, with 6, 8 or more barbels . . . . . *Cobitidae* p. 21.
   b. No movable prae- or subocular spine; eye with a free orbital margin; mouth anterior or inferior with never more than 4 barbels. . . . . *Cyprinidae* p. 43.

1. Fam. HOMALOPTERIDAE.

Head and anterior part of body depressed, lower surface flattish. Pectorals and ventrals horizontally inserted, generally several of their outer and sometimes of their inner rays simple. No movable spine before or below eye. Dorsal and anal fins short, the former opposite to ventrals. Mouth inferior, its upper border formed by intermaxillaries only. At least three pairs of barbels, which may be nasal, rostral or maxillary barbels. Scales small, cycloid. Lateral line present. Gillopenings narrow. Gillmembranes united with isthmus. No pseudobranchiae. Pharyngeal teeth in a single series, eight to numerous in number. Airbladder reduced, divided into two lateral portions, each enclosed in a bony capsule.

Distribution: Southern Asia, in fresh water.

Key to the indo-australian genera.

1. Ventrals with 18—21 rays, united to form a suctorial disk . . . . . *Gastromyzon* p. 2.
2. Ventrals separated, with 8—11 rays.
   a. Five pairs of barbels, one nasal pair . . . . . *Glaniopsis* p. 5.
   b. Three to four pairs of barbels, no nasal ones.
      α. Three pairs of barbels, two of which in front of snout . . . . . *Homaloptera* p. 6.
      β. Four pairs of barbels, three pairs of which in a horse-shoe shaped groove before mouth. . . *Parhomaloptera* p. 20.

1. Gastromyzon Günther.

(GÜNTHER, Ann. Mag. Nat. Hist. (4) XIV. 1874, p. 454).

(*Lepidoglanis* Vaillant, *Neogastromyzon* Popta).

Head and anterior part of body ventrally flattened. Head and snout broad, rounded, eye superior, with a free orbital margin. Anterior and posterior nostrils separated by a cutaneous flap. Mouth inferior, transverse, slightly curved; at its corner a more or less rudimentary barbel, 4 others before the mouth. Pectorals with a long base beginning vertically below eye; ventrals with a long curved base, united posteriorly; between base of pectorals and ventrals a lateral extension of the abdominal skin (Fig. 1*a*). By this arrangement the whole flattened abdominal surface, together with the fins and the flattened

lower surface of the head forms an enormous suctorial disc. Ventrals with 18—21 rays. Dorsal and anal short. Scaly with

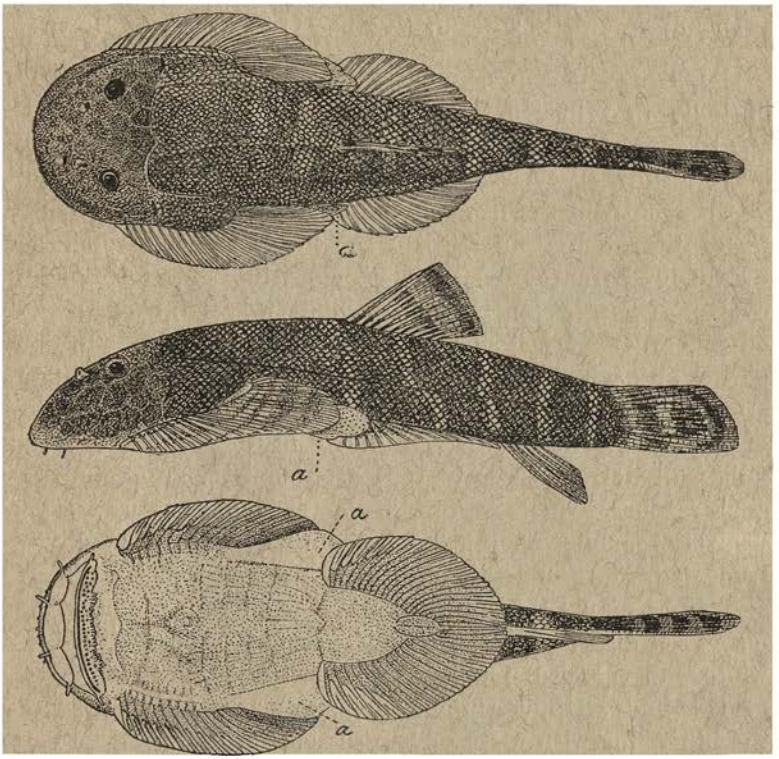

Fig. 1 Upper, lateral and ventral view of *Gastromyzon borneensis* Gthr. × 2. *a*. lateral extension of the abdominal skin.

exception of head and lower surface. Branchial openings small, above base of pectorals.

Distribution: Borneo, in mountain streams.

Key to the species.

1. Breadth of body 3.2 in length. Ventrals reaching anal. *G. borneensis* p. 3.
2. Breadth of body 5 in length. Ventrals far remote from anal. . . . . *G. nieuwenhuisi* p. 4.

1. Gastromyzon borneensis Gthr. [Fig. 1].

Gastromyzon borneensis Günther, Ann. Mag. Nat. Hist. (4) XIV. 1874, p. 454.
Lepidoglanis monticola Vaillant, Compt. rend. Congrès intern. Zool. 1889, p. 81.
Gastromyzon monticola Vaillant, Compt. rend. sommaires Soc. Philom. de Paris nº. 2, 9 Nov. 1891. — Nouv. Arch. Mus. Hist. Nat. (3) V. 1893, p. 94.
Gastromyzon borneensis Steindachner, Abh. Senckenb. Naturf. Ges. XXV. 1901, p. 455.

Gastromyzon borneensis Fowler, Proc. Acad. Nat. Sc. Phil. (2) LVII. 1905, p. 477.
Gastromyzon borneensis Popta, Notes Leyden Mus. XXVII. 1906, p. 187.

D. 3.8; A. 1.6; P. 26—28; V. 20—21; L. l. circa 65; L. tr. $\frac{19}{12}$.

Height 5.5 or more, about 7 in length with caudal. Breadth of body 3.2 in length, 4 in length with caudal. Head $3^1/_2$, $4^3/_4$ to more than 5 in length with caudal. Eye 5.5—8, 2.5—4 in interorbital space, according to size; situated in the third fourth of the length of the head. Mouthopening very slightly curved, $^2/_3$ of the greatest breadth of the head. Upper lip concealed by rounded frontborder of head, consisting anteriorly of three oval portions, a larger median and two lateral ones; at the outer corner of lastnamed a small barbel, an equally small barbel on each side between the median and lateral one; they are shorter than the eye. A smaller one on a fold at the corner of the mouth, which is continued in the fringed lower lip. Origin of dorsal nearer to root of caudal than to snout. The anal reaches, when depressed, on caudal. Innermost rays of ventrals reaching anal. Caudal about equal to head, obliquely truncated. More or less dark brown, lower surface whitish. Head and back may be uniform or have small brown spots, which may form an irregular network. There may be narrow, yellowish white, more or less regular, transverse lines on the hinderpart of the body. Upper surface of pectorals and ventrals as also the other fins with more or less distinct brown spots or bands. Length over 100 mm.

Nomen indig.: Dekŏt ok (Bongan), Tapat (Howong), Lēkēt or Kētipit (Kajan), Dehat (Mahakam).

Habitat: Borneo (Upper Kapuas, Bongan, Upper Mahakam with its affluents Bŏ, Blūū, Howong!, Kajan, source of the Mingalong, Kadamaian river on Kina Balu, Mount Dulit).

Living in mountain torrents. According to Günther, they dart rapidly across the swiftest currents from one stone to another, and stick like limpets to the stones, along which they crawl slowly like a molluscous animal.

2. **Gastromyzon nieuwenhuisi** (Popta).

Neogastromyzon Nieuwenhuisii Popta, Notes Leyden Mus. XXV. 1905, p. 181. — ibid. XXVII. 1906, p. 192.

D. 2.7; A. 2.5; P. 1.24; V. 18; L. l. 90; L. tr. $\frac{21}{10}$.

Height 5, equal to breadth, 6. 3 in length with caudal. Head 4. 5, 5. 7 in length with caudal. Eye 6. 4, 3 times in interorbital space, situated in the third fourth of the head. Mouth-opening curved, $^2/_3$ of the greatest breadth of the head. Upper lip concealed below the frontborder of the snout. Before the cleft of the mouth 4 subequal barbels, about half the diameter of the eye. Between the two middle ones three great papils. At the corner of the mouth a triangular fleshy fold, with a rudiment of a barbel, looking like a great papil. Lower lip with 9 great papils, situated in a curved line. Origin of dorsal behind middle of length. Anal, when depressed, nearly reaches the caudal, its origin far remote from end of ventrals. Caudal slightly emarginate, lobes pointed, the lower the longer, longer than head. Yellowish, head olivaceous, marmorated, upperside otherwise with numerous irregular, transverse, brown bands. Fins yellowish, caudal with irregular brown transverse bands. Anterior rays of ventrals and pectorals olivaceous. Length of single specimen known 63 mm. [Type of the species in the Leyden Museum seen by us].

Nomen indig.: Sēkēlut.

Habitat: Borneo, river Howong!

2. **Glaniopsis** Boulenger.

(Boulenger, Ann. Mag. Nat. Hist. (7) IV. 1899, p. 228).

Head and anterior part of body depressed; snout scarcely projecting beyond the mouth, which is moderately large. Eyes nearly superior, whithout free orbital margin. Five pairs of barbels — two in front of the snout, two at the angle of the mouth, and one between the two nasal openings. Mouth as in *Homaloptera*; gillopenings narrow. Body covered with small scales, head naked; lateral line present. Dorsal fin short, further back than base of ventrals; anal short; pectoral and ventral fins horizontal, manyrayed, the outer rays simple.

Distribution: The single species is only known from Borneo.

1. **Glaniopsis hanitschi** Blgr.

Glaniopsis Hanitschi Boulenger, Ann. Mag. Nat. Hist. (7) IV. 1899, p. 228.

D. 2. 6; A. 2. 5; P. 1. 12; V. 2. 7.

Depth of body $6^1/_2$ times in total length, length of head 5 to $5^1/_2$ times. Head scarcely longer than broad; snout rounded;

eye in the middle of the length of the head, its diameter 5 times in length of head, $2^1/_2$ in interorbital width; barbels subequal in length, twice as long as diameter of eye. Dorsal commencing a little behind base of ventrals, situated at equal distance from the end of the snout and the end of the caudal. Pectorals as long as head, terminating at a considerable distance from the ventrals. Caudal as long as head, scarcely emarginate. Caudal peduncle as long as deep. Scales extremely small,

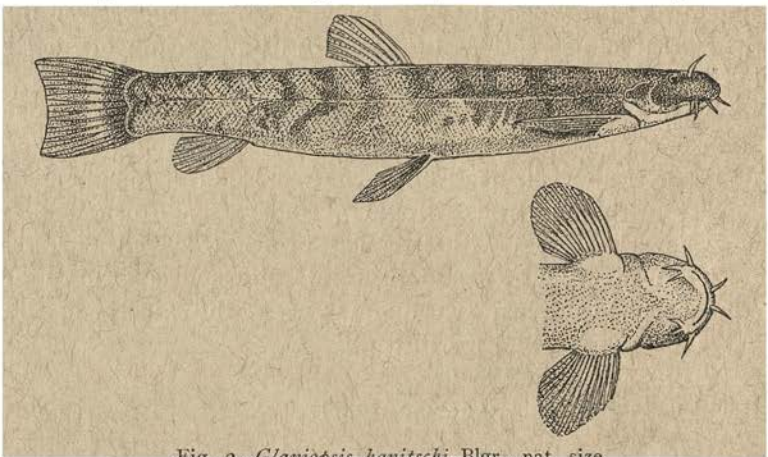

Fig. 2. *Glaniopsis hanitschi* Blgr., nat. size.
(After R. Hanitsch. Roy. Asiat. Soc., Straits Branch. XXXIV. 1900, pl. II).

smooth; lat. line 120—125. Yellowish brown above, with transverse dark brown spots or interrupted cross-bands; head dark olive-brown above; lower parts whitish; dorsal and caudal greyish, the latter blackish at the base; pectorals greyish olive above, white beneath; ventrals and anal white; a black spot at base of ventrals. Total length 93 mm. [The type of the species in the British Museum seen by us].

Habitat: Mount Kina Balu, in the Kadamaian River, at an altitude of 2100 feet.

A female contains ripe ova of large size, 2 mm. in diameter.

3. **Homaloptera** van Hasselt.

(VAN HASSELT, Algem. Konst- en Letterbode 1823, II. p. 130).

Head and anterior part of body depressed. Snout rounded, depressed. Eyes high, nearly superior, with a free orbital margin. Anterior and posterior nostrils separated by a membrane.

Mouth inferior, its cleft small, curved, its frontborder with a thick lip, continued round its corners. Jaws with a hard, blunt cutting-edge. Two pairs of barbels in front of snout and one at each angle of the mouth. Dorsal and anal short, the former opposite to ventrals, which are horizontal even as the pectorals, the outer rays of which are simple. Ventrals with 8—12 rays. Caudal more or less emarginate or deeply forked. Scales small,

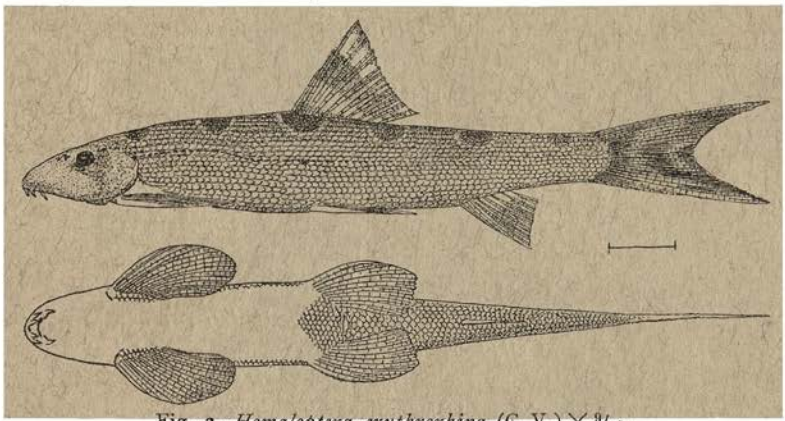

Fig. 3. *Homaloptera erythrorhina* (C. V.) × 9/10.

wanting in smaller or greater extent on abdomen. Lateral line present. Gillopenings narrow, above and before base of pectorals. Gillmembranes united with isthmus. No pseudobranchiae.

Distribution: Fresh water, especially mountain streams of indo-australian Archipelago (Sumatra, Java, Borneo) and south eastern part of continental Asia.

Artificial key to the indo-australian species of Homaloptera.

I. Origin of dorsal behind origin of ventrals (*Homalopteroides* Fowler).

1. Lateral line 43—47.

a. Dorsal nearer to caudal than to snout. Caudal deeply emarginate . . . . . *H. wassinki* p. 9.

b. Dorsal in middle between caudal and snout. Caudal slightly emarginate . . . . . *H. ocellata* p. 10.

2. Lateral line 60 or more.

a. Lower surface partly scaly.

1. L. l. 60; eye 4 times in head, thrice in interorbital space, barbels twice as long as eye . . . . . *H. modiglianii* [1]) p. 11.
2. L. l. 63—73; eye 6 times or less in head, more or less than twice in interorbital space; barbels slightly longer or slightly shorter than eye; origin of dorsal before middle of length.
   a. Origin of A. much nearer to base of C. than to that of V. Ventral surface scaly only between and behind ventrals.
      α'. 30 scales between dorsal and occiput . . . . . *H. gymnogaster* p. 11.
      β'. 50 scales between dorsal and occiput . . . . . *H. amphisquamata* p. 12.
   β. Origin of A. in the middle between base of C. and that of V. Ventral surface scaly only behind ventrals. . *H. heterolepis* p. 12.
3. L. l. 74; eye $5^1/_2$ times in head, more than twice in interorbital space, outer barbels scarcely visible, inner ones equal to eye, origin of D. behind middle of length . . . . . *H. whiteheadi* p. 13.

b. Abdomen totally scaly. . . . . *H. lepidogaster* p. 14.

II. Origin of dorsal before origin of ventrals. (*Homaloptera* s. str.).

1. L. l. 45—48.
   a. Height 8—$8^1/_2$. Scales on upper surface with a single strong keel . . . . . *H. zollingeri* p. 14.
   b. Height $10^1/_4$—$11^1/_2$. Scales on upper surface with a single keel, the anterior ones with 2 or 4 short keels besides . . . . . *H. ophiolepis* p. 15.
2. L. l. 63 to about 70.
   a. Ventral surface, except between pectorals, totally scaly. . . . . *H. orthogoniata* p. 15.
   b. Ventral surface scaly between anus and anal and on a triangular patch before ventrals, otherwise naked.
      α. Height less than 7. Longest rays of pectorals shorter than head . . . . . *H. erythrorhina* p. 17.

1) We are not sure that *H. modiglianii* belongs to this group, as the diagnosis of Perugia of this species gives no information about the absence or presence of scales on the abdomen.

β. Height more than 7. Longest rays of pectorals longer than head . . . . . *H. pavonina* p. 18.

c. Ventral surface totally naked . . . . . *H. tate regani* p. 19.

1. Homaloptera wassinki Blkr.

Homaloptera fasciata van Hasselt, Algem. Konst- en Letterbode 1823, II. p. 130 (no description).

Homaloptera wassinkii Bleeker, Nat. Tijdschr. Ned. Indië IV. 1853, p. 163.

Homaloptera fasciata Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 96. — Atl. Ichth. III. 1863, p. 20.

Homaloptera wassinkii Günther, Cat. Brit. Mus. VII. 1868, p. 342.

? *Homaloptera* (*Helgia*) *modesta* Boulenger, Ann. Mag. Nat. Hist. (6) VIII. 1894, p. 251.

Homaloptera wassinkii Vaillant, Notes Leyden Mus. XXIV. 1902, p. 31.

? *Homalopteroides wassinkii* Fowler, Proc. Acad. Nat. Sc. Philad. (2) LVII. 1905, p. 476.

Helgia modesta Popta, Notes Leyden Museum XXVII. 1906, p. 186. (nec Vinciguerra) [1]).

D. 3. 7; A. 2. 5; P. 6. 10. 1; V. 2. 6. 1; L. l. ca 47, perforated scales 43—45; L. tr. $\frac{6^1/_2}{1}$ $\frac{}{8^1/_2}$ (to base of ventrals).

Height 5.7, about 7 in length with caudal. Head 4.3, about 5—$5^1/_2$ in length with caudal, its breadth about $^5/_6$ of its length. Eye 4.5—6, about thrice in snout, somewhat less than twice in the interorbital space. Lips somewhat swollen, not fringed; barbels minute, subequal, shorter than eye. Origin of dorsal behind middle of snout and root of caudal, corresponding to about the 21st lateral scale and opposite to inner ray of ventrals, separated by 23 rows of scales from the head. Origin of anal below the 34th lateral scale, somewhat nearer to end of ventrals than to base of caudal. Ventrals opposite to 17th perforated scale, not reaching anus, slightly shorter than head. Pectorals reaching ventrals, more than one eye diameter longer than head. Caudal equal to head, deeply emarginate, lobes pointed, the lower the longer. Scaly, with exception

1) Through the kindness of Dr. R. GESTRO, Director of the Museo Civico di Genova, we had the opportunity to study 2 specimens of *Helgia modesta* Vinciguerra from Burma. They are closely allied to *Homaloptera wassinki* Blkr. but distinguished at once from this species by the lower number of pectoral rays which is 6.8 and by the slightly emarginate caudal. Miss C. POPTA, Ph. D. has called a specimen from river Mahakam, Borneo, *Helgia modesta*. It seems us more probable, that it belongs to *Homaloptera wassinki* Blkr. She gives the number 5.11 for the pectoral rays (one of us has counted 6.11), and gives besides other small differences from *Helgia modesta*.

of the abdomen, which is naked anteriorly from a point somewhat in advance of ventrals. Eighteen scales round caudal peduncle. Eight pharyngeal teeth. Yellowish, back darker, 5 or 6, more or less conspicuous dark crossbands on the back. Fins with 2 or 3 dark transverse bands. Length about 65 mm.

Nomen indig.: Salusur (Sundan.).

Habitat: Sumatra (Lahat); Java (Bantam [British Museum], Tjampea, Buitenzorg!, Kediri); Borneo (river Kapuas, river Mahakam, Sarawak).

2. Homaloptera ocellata (C. V.).

Balitora ocellata Cuvier & Valenciennes, Hist. Nat. Poissons. XVIII. 1846, p. 96. *Homaloptera Valenciennesi* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 95. — Atl. Ichth. III. 1863, p. 19.

D. 9; A. 6; P. 17; V. 9; L. l. 47; perforated scales 42.

Height 7.6, 9 in length with caudal. Head 4.8, 5.8 in length with caudal; its breadth $^7/_{10}$ of its length. Eye 3.5, twice in snout and 1.1 in interorbital space. Origin of dorsal in the middle between end of snout and caudal, behind that of ventrals, opposite to 19th perforated scale of lateral line, separated by 21 rows of scales from head. Origin of anal opposite to 31st perforated scale of lateral line. Origin of ventrals opposite to 17th perforated scale of lateral line. Pectorals slightly longer than head, reaching ventrals. Caudal equal to head, slightly emarginate, not deeply forked. Scaly, naked only between the pectorals (according to Cuvier & Valenciennes: „la peau du dessous de la gorge et du ventre est nue et sans écailles"). Eighteen scales round the caudal peduncle. Colour of the alcohol specimen rufous, with 5 black round blotches on the back of the tail. Length of single known specimen 73 mm.

Habitat: Java (Buitenzorg).

Note: As the description of CUVIER & VALENCIENNES was so insufficient that we at first thought that it was identical with *Homaloptera erythrorina* (C.V.), we asked Dr. J. PELLEGRIN to inform us about the type in the Paris Museum. He was so kind to give us ample information about the principal characters of the specimen of CUVIER & VALENCIENNES, which enabled us to give the above description. It shows that it is nearest to *H. wassinki,* but differs from it by minor height, larger eyes, by the position of the dorsal and by the caudal which is only slightly emarginate.

In the single specimen described by Miss POPTA Ph. Dr. (see note on page 9) from Borneo, we find the height and the caudal as in *H. wassinki,* but the eye and the position of the dorsal is as in *H. ocellata.* As also *H. ocellata* is founded on a single specimen, we think it possible, that *H. ocellata* and *H. wassinki* belong to one and the same species.

3. Homaloptera modiglianii Perugia.

Homaloptera modiglianii Perugia, Ann. Mus. Civ. Genova (XXXIII) (2) XIII. 1893, p. 245.

D. 9; A. 9; L. l. 60.

Head broad, its profile arcuate, snout much longer than postocular part of head. Lips not fringed. Barbels short, thick and twice the diameter of the eye. Eye small, situated in the posterior part of the head, its diameter is $^1/_3$ of the interorbital space, and $^1/_4$ of the length of the head and $^1/_2$ the length of the snout. Head $^1/_4$ of total length. Origin of the dorsal opposite to the last internal ray of the ventrals. Pectorals as long as head, nearly reaching ventrals. Caudal slightly emarginate, its lobes quite equal. Colour in alcohol yellowish, marmorated with brown. A black band at the base of the caudal. Fins yellowish, immaculate. [After Perugia, not seen by us].

Habitat: Sumatra (Si Rambé).

4. Homaloptera gymnogaster Blkr.

Homaloptera gymnogaster Bleeker, Nat. Tijdschr. Ned. Ind. IV. 1853, p. 163. — Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 98. — Atl. Ichth. III. 1863, p. 20. *Homaloptera gymnogaster* Günther, Cat. Brit. Mus. VII. 1868, p. 341.

D. 2.7—8; A. 2.6; P. 5.9 (10).1; V. 2.7; L. l. circa 70.

Height $8^1/_2$ in total length. Head 6 in total length, its breadth about $1^1/_3$ in its length. Eye 6—$6^1/_2$, less than twice in the interorbital space, situated for its greater part in the hinder half of the head. Snout obtuse, as long as the remaining portion of the head. Barbels subequal, slightly shorter than eye. Lips not fringed. Origin of dorsal slightly behind origin of ventrals, separated by 30 scales from the occiput. Dorsal acute, slightly emarginate, higher than body, shorter than high. Anal acute, its height equal to that of body. Ventrals not reaching anal, subequal to pectorals, which do not reach ventrals. Caudal emarginate, its lobes acute, the inferior slightly the longer, 5 times in length. Ventral surface scaleless, scales only present between ventrals and in a triangular patch before them.

About 8 pharyngeal teeth. Colour brownish or yellowish green above, lighter inferior. Middle of caudal with a brownish transverse band. Length of the single specimen known 75 mm. [Type of the species in the British Museum seen by us].

Habitat: Sumatra (Lake Manindjau!).

5. **Homaloptera amphisquamata** n. sp.

D. 3.7; A. 3.5; P. 6.9 (10).1; V. 2 (3).6.1; L. l. 70—73; L. tr. ca $\frac{12—13}{1}$ (to base of ventrals).

Height about 7.2—7.7; 8.5—9 in length with caudal. Head 4.7—4.8; 5.5—5.6 in length with caudal, its breadth about $^4/_5$ of its length. Eye less than 5, much less than twice in interorbital space and nearly twice in snout. Barbels subequal, the outer ones, which are the longest, about as long as eye. Origin of dorsal behind origin of ventrals, much nearer to snout than to base of caudal, corresponding to 28th perforated scale of lateral line, separated by about 50 or more scales from occiput. Dorsal truncate, its height about equal to that of body. Origin of anal much nearer to base of caudal than to base of ventrals, situated below the 55th to 58th perforated scale of lateral line. Ventrals far distant from anus. Longest rays of ventrals and pectorals nearly equal, much shorter than head. Pectorals not reaching ventrals. Caudal nearly truncate, somewhat shorter than head. Scales on the upper anterior part of trunk much smaller than the posterior ones. Scales on ventral surface only present between and behind ventrals. Greyish brown, with 8 or less irregular blackish transverse bands on the back, much broader than the interspaces. A blackish band on the base of the caudal, and a very broad submarginal one; dorsal with a dark longitudinal band. Length 70 mm. [Type of the species in the Zoological Museum of Amsterdam].

Habitat: Sumatra (Lau Borus, discharching river of Lake Kawar (Laut Kawar) Karo-tableland Deli!), 58 examples collected by Dr. L. PH. DE BUSSY.

6. **Homaloptera heterolepis** n. sp.

D. 2.7; A. 2.5; P. 4 (5).8 (9).1; V. 2.7—8; L. l. 63—70; L. tr. circa $\frac{12}{1}$ (to base of ventrals).

Height 6.4—6.7, 7.6—7.9 in total length with caudal. Head

4.7—4.9, 5.6—5.8 in length with caudal, its breadth about $^5/_7$ of its length. Eye about 5, twice in interorbital space, more than twice in the snout. Barbels subequal, slightly longer than eye. Origin of dorsal behind origin of ventrals, much nearer to snout than to base of caudal, corresponding to the 28th perforated scale of lateral line, separated by more than 50 scales from the occiput. Dorsal truncate, its height about equal to that of body. Origin of anal about in the middle between base of caudal and end of base of ventrals, below the 46th to 52nd perforated scale of lateral line. Ventrals not reaching anus, about equal to pectorals. Pectorals much shorter than head, not reaching ventrals. Caudal nearly truncate, about equal to head. Scales on the upper anterior part of trunk much smaller than the posterior ones. Scales on abdomen only behind ventrals. About 12 pharyngeal teeth. Greyish with irregular series of black spots on the back, which are more or less confluent on the sides. Lower surface uniform. Irregular transverse series of spots on fins. Length 80 mm. [Type of the species in the Zoological Museum of Amsterdam].

Nomen indig.: Ikan ili.

Habitat: Sumatra (Atchin, Lake Tawar!); 5 examples collected by Mr. V. D. WERFF.

7. Homaloptera whiteheadi Vaillant.

Homaloptera Whiteheadi Vaillant, Nouv. Arch. Mus. Hist. Nat. (3) V. 1893, p. 92.

D. 1.8; A. 1.5; P. 1.21; V. 8; L. l. 74; L. tr. $\frac{12}{\frac{1}{11}}$.

Height about 8, more than 10 in length with caudal. Head almost 5, a little more than 6 in length with caudal. Eye more than $5^1/_2$, situated in the third fifth of the head, $2^1/_3$ in interorbital space. Lips not fringed. Barbels feebly developed, decreasing in size from inner to outer ones, which are scarcely visible; the inner ones being about equal to the eye. Origin of dorsal slightly behind middle of $\frac{1}{3}$ length, slightly behind origin of ventrals. Anal placed far back; laid back it reaches base of caudal. Pectorals not reaching ventrals. Caudal nearly truncate, longer than head. Abdomen scaly only in its posterior third. Colour of alcohol specimens light, with brown marmorations. A narrow brown band along the lateral line. Length 52 mm. [After Vaillant, not seen by us].

Habitat: Borneo (Mount Kina Balu).

8. **Homaloptera lepidogaster** n. sp.

D. 3.7; A. 2.5; P. 6.8 (9).1; V. 2.6.1; L. l. 61—63.

Height 6.2, 7.5 in length with caudal. Head 4.1, 5 in length with caudal, its breadth about $^5/_6$ of its length. Eye 6, situated immediately behind middle of head, about twice in the interorbital space. Upper lip and exterior half of lower lip swollen. Barbels subequal, about equal to eye. Origin of dorsal opposite to about the 25th or 26th perforated scale, somewhat before middle between snout and base of caudal, opposite to base of inner ray of ventrals, separated by about 40 scales from the occiput. Height of dorsal nearly equal to height of body, that of the anal slightly less. Origin of anal in the middle between root of caudal and origin of inner ventral ray. Ventrals not reaching anus, nearly equal to head. Pectorals reaching ventrals or nearly so, their longest rays equal to head. Caudal probably slightly emarginate, nearly equal to head. Posterior half of abdomen and space between ventrals totally scaly. Dark brown, back with 4—5 darker patches, one at the origin of dorsal, the others behind dorsal; a blackish band at base of caudal; dorsal and caudal with an irregular, broad blackish band. Length 60 mm. [Type of the species in the Zoological Museum of Amsterdam].

Habitat: Sumatra (Matur, Padangsche Bovenlanden!), collected by Mr. EDW. JACOBSON.

9. **Homaloptera zollingeri** Bleeker.

Homaloptera Zollingeri Bleeker, Nat. Tijdschr. Ned. Indië IV. 1853, p. 159.
Homaloptera javanica Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 89. — Atl. Ichth. III. 1863, p. 17.
Homaloptera zollingeri Günther, Cat. Brit. Mus. VII. 1868, p. 342.

D. 2.8—9; A. 2.5—6; P. 4.9 (10).1; V. 2.8; L. l. ± 45.

Height 8—$8^1/_2$ in length with caudal. Head 6—$6^1/_3$ in length with caudal, its breadth more than 1 to $1^1/_3$ in its length. Eyes $4^1/_2$—$5^1/_2$, situated for the greater part in the posterior half of the head, less than twice their diameter apart. Barbels subequal, shorter than eye. Origin of dorsal slightly before origin of ventrals, separated by 15 scales from the occiput. Dorsal acute, not emarginate, higher than body. Anal acute or obtuse, equal to height of body or slightly lower. Ventrals not reaching anal, shorter than pectorals. Pectorals not reaching ventrals. Caudal rather deeply emarginate, the lobes acute, the inferior the longer, $4^3/_4$ to more than 5 in the length.

Abdomen scaly, with exception of the space between the pectorals. Scales of the belly smaller than the others and not provided as those with a strong keel. About 10 pharyngeal teeth. Colour brownish above, lighter below, with about 6 obscure crossbands. Caudal brown, its upper lobe with two or three oblique bands. Length 100 mm. [After Bleeker and Günther. Not seen by us).

Nomen indig.: Salusur (Sundan.).

Habitat: Java (Batavia, Bandung); Sumatra (Lahat); Siam (British Museum).

10. Homaloptera ophiolepis Blkr.

Homaloptera ophiolepis Bleeker, Nat. Tijdschr. Ned. Indië IV. 1853, p. 160. — Ichth. Arch. Ind. Prodr. II. Cyprini. 1860, p. 90. — Atl. Ichth. III. 1863, p. 18.
Homaloptera ophiolepis Günther, Cat. Brit. Mus. VII. 1868, p. 342.

D. 3.8—9; A. 2.5—6; P. 4—5.9—11.1; V. 2.8; L. l. 45—48.

Height $10^1/_4$—$11^1/_2$ in total length. Head 6—7 in length with caudal, its breadth $1^1/_4$—$1^1/_2$ in its length. Eyes $4^1/_2$—$5^1/_2$, situated in the beginning of the posterior half of the head, less than twice their diameter apart. Barbels subequal, equal to eye or slightly longer. Origin of dorsal slightly before that of ventrals, separated by about 15 scales from the occiput. Dorsal acute, not or slightly emarginate, much higher than body. Anal acute, not or slightly emarginate, not or only slightly higher than body. Ventrals somewhat shorter than pectorals, not reaching anal. Pectorals not reaching ventrals. Caudal deeply emarginate, lobes acute, the lower the longer, $4^1/_2$—5 in length. Abdomen scaly, excepting the space between the pectorals. Scales of belly smaller than the others, which are provided with a very strong median keel, those of the anterior part of the body with 2 or 4 short keels besides. Brownish above, lighter below. Seven large round brown spots on the back, 4 of which behind the dorsal. Sides with large brown roundish unequal spots. Fins with brown crossbands. Length 124 mm. [Specimens of Bleeker's collection seen by us in the Leyden Museum].

Nom. indig.: Salusur (Sundan.).

Habitat: Java (Parongkalong, Bandung); Sumatra (Lahat); Borneo (Mahakam river).

11. Homaloptera orthogoniata Vaill.

Homaloptera bilineata Boulenger, Ann. Mag. Nat. Hist. (6) XIII. 1894, p. 251. (nec Blyth).
Homaloptera orthogoniata Vaillant, Notes Leyden Mus. XXIV. 1902, p. 122.

Homaloptera orthogoniata Fowler, Proc. Acad. Nat. Sci. Philad. (2) LVII. 1905, p. 475.
Homaloptera orthogoniata Popta, Notes Leyden Mus. XXVII. 1906, p. 181.

D. 2—3.8—9; A. 2—3.5—6; P. 5.10.1; V. 2.8; L. l. 63—67; L. tr. $\frac{10}{11}$.

Height about 5, 6.7 in length with caudal. Head 4.5—5, 5.7 in length with caudal, its breadth $1^1/_4$ in its length. Eye 10, situated in the fourth fifth of the head and 4 times in interorbital space. Lips thick and fleshy, lower lip formed into

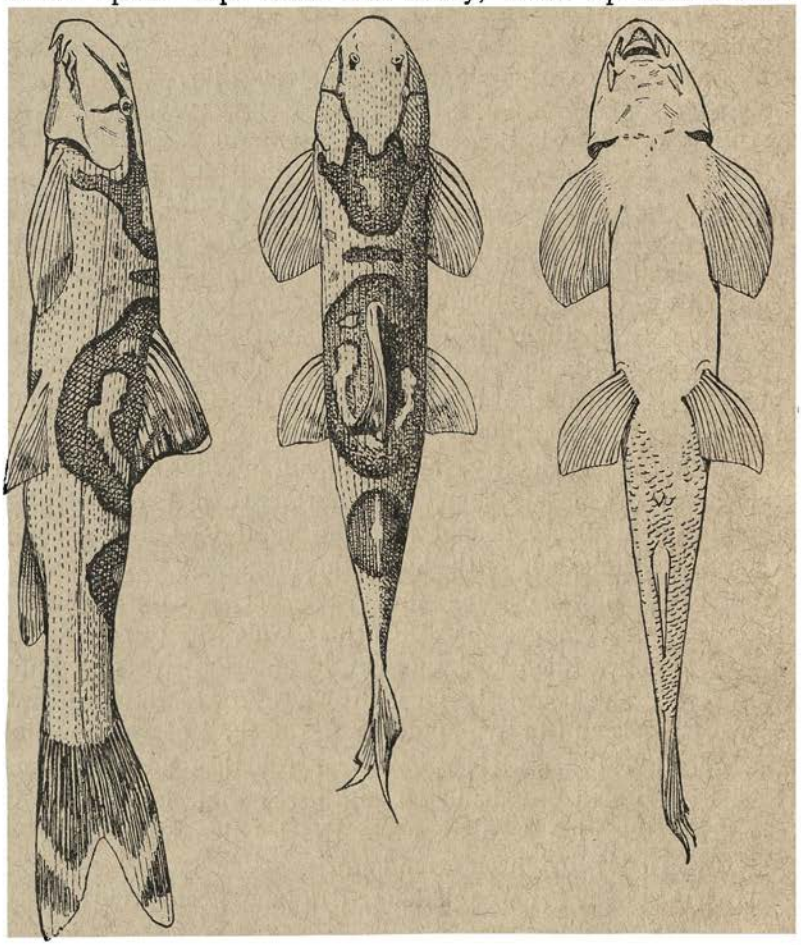

Fig. 4. *Homaloptera orthogoniata* Vaill. (After Vaillant).

three thick fleshy folds. Barbels equal, robust, short. Origin of dorsal before middle of length, a little before origin of ventrals. Dorsal truncate, its height about equal to that of the

body. Anal inserted about midway between origin of ventrals and base of caudal. Ventrals reaching or surpassing anus. Pectorals far distant from ventrals. Caudal slightly emarginate, lobes subequal. Scales with a median rather strong keel, sometimes with one or two pairs more of weaker ones. Space between pectorals naked, ventral surface otherwise covered with very small scales. Fifteen pharyngeal teeth. Colour in alcohol brown, clouded with large distinct irregular dorsal blotches or areas of deep brown, a large one between dorsal and ventrals. Ventral surface a little paler brown than upper surface. A brown streak from tip of snout to eye, and continued behind it up to occiput, an other streak downward across side of head. These streaks all with narrow pale brownish margins. Dorsal and anal brownish-white clouded with dull blackish or blackish-brown. Anal similar, also pectorals and ventrals, though all these fins have more white and the dark colours more diffuse. Length 125 mm. [Type of the species in the Leyden Museum seen by us].

Nomen indig.: Kětápang (Bongan), Tesiot (Howong), Fidjan (Blūū).

Habitat: Borneo (rivers Raun and Bongan, system of Upper Kapuas, rivers Blūū and Howong, system of Mahakam river, Baram river!).

Note: We have seen the specimens in the British Museum described by BOULENGER as *Homaloptera belineata* Blyth. They belong, after our opinion, also on account of their striking colour, not to *H. bilineata* Blyth from continental Asia but to the present species.

12. **Homaloptera erythrorhina** (C. V.) [Fig. 3, p. 7].

Homaloptera ocellata van der Hoeven, Handboek Dierkunde, 1. ed. vol. II. p. 211 (no description).

Balitora erythrorhina Cuvier & Valenciennes, Hist. Nat. Poissons XVIII. 1846, p. 93.

Homaloptera salusur Bleeker, Nat. Tijdschr. Ned. Indië IV. 1853, p. 161.

Homaloptera polylepis Bleeker, ibid. p. 162.

? *Homaloptera ocellata* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 92. — Atl. Ichth. III. 1863, p. 18. (nec C. V.).

Homaloptera salusur Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 94. — Atl. Ichth. III, 1863, p. 19.

Homaloptera pavonina Günther, Cat. Brit. Mus. VII. 1868, p. 341 (p. p.).

Homaloptera pavonina Max Weber, Zool. Ergebnisse Reise Nied. Ost-Indien Hft. 2, 1894, p. 424 (nec C.V.).

D. 3.7—8; A. 3.5; P. 6.10. 1; V. 2.6.1; L. l. 63—65 (perforated scales); Sq. l. 70 or more.

Height 5.8 [5.4—6.6] [1]) 7.1—8 in total length. Head 4.4—4.6, 5.5 to more than 6 in total length, its breadth $1^2/_5$ in its length. Eye 6.3—7.5 [4.6—6.8], more than 3 to 4 times in snout, behind middle of head and more than twice in the interorbital space. Upper lip swollen as also exterior halves of lower lip, which are rather distinctly separated from the middle part. Barbels subequal, shorter than eye. Origin of dorsal distinctly before middle between snout and root of caudal, before origin of ventrals, opposite to about the 20th [18th—21st] perforated scale, separated by more than 22 [21—24] scales from the occiput. Dorsal concave, its height more than that of body; that of the anal $^1/_3$ less. Origin of anal opposite to about the 42nd [39th—41st] perforated scale and about in the middle between root of caudal and base of ventrals. Ventrals reaching anus, slightly shorter than head. Pectorals far distant from ventrals, their longest rays shorter than head. Caudal deeply forked, its lobes pointed, longer than head. Abdomen scaly, with exception of a median naked part beginning before the apex of a triangular scaly patch situated before the base of ventrals. Most scales of back and sides with a keel, which slightly projects beyond the margin of the scale. About 10 pharyngeal teeth. Brownish, underside lighter. A series of six or seven large brown yellow-edged ocelli along the back, which may fuse into three large patches. In one specimen we see a narrow brown band running on the head from the snout, through the eye, to the occiput. Fins with a rather broad dark transverse band. Caudal obliquely and asymmetrically banded. Length 132 mm.

Nomen indig.: Salusur (Sundan.).

Habitat: Java (Batavia, Buitenzorg!, Tjipanas, Tjampea, Bandung, Garut!, Ngantang); Sumatra (Lahat).

In rivers, brooks and torrents.

13. **Homaloptera pavonina** (C.V.).

Balitora pavonina Cuvier & Valenciennes, Hist. Nat. Poissons, XVIII. 1846, p. 97. *Homaloptera pavonina* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini. 1860, p. 92. — Atl. Ichth. III. 1863, p. 18.

1) Where there was discrepancy from the specimens seen by us, we have given in square brackets what was found by Dr. J. PELLEGRIN in the 3 specimens of C. V., which were kindly measured for us by the french ichthyologist.

D. 10; A. 6; P. 18; V. 9; L. l. 71 (59 perforated scales). Height 7.7, 9.8 in length with caudal. Head 5.3, 6.7 in length with caudal; its breadth about $1^2/_5$ in its length. Eye 5.1, 2.6 in snout, less than twice in interorbital space. Lips thick, barbels short. Origin of dorsal nearer to end of snout than to caudal, opposite to the 17th scale of the lateral line, separated by 23 scales from occiput. Anal opposite to 37th perforated scale of lateral line. Ventrals rounded. Pectorals far distant from ventrals, their longest rays longer than head. Caudal deeply emarginate, the lower lobe the longer, much longer than head. Abdomen naked to before ventrals. Scales with an elevated keel, projecting beyond their margin; 24 scales round caudal peduncle. Blackish above, round black points in front of dorsal, 5 black ocelli, bordered by white, behind the dorsal. Fins spotted with black. Length of single specimen known 108 mm. [Not seen by us; diagnosis after the description of Valenciennes and informations, kindly given to us by Dr. J. PELLEGRIN].

Habitat: Java.

14. Homaloptera tate regani Popta.

Homaloptera Tate Reganii Popta, Notes Leyden Mus. XXV. 1905, p. 180. — ibid. XXVII. 1906, p. 182.

D. 3.8; A. 2.5; P. 8.12; V. 2.8; L. l. 64; L. tr. $\frac{6}{1}$.

Height $7^{11}/_{17}$, 10 in length with caudal. Head $4^9/_{14}$, 6 in length with caudal. Eye 7, four in snout, behind middle of head, almost thrice in the interorbital space. Barbels equal, and as long as eye. Origin of dorsal before middle of length, separated by 14 scales from the occiput. Fourth ray of concave dorsal opposite to origin of ventrals; height of dorsal $^5/_7$ length of head. Anal truncate. Ventrals not reaching anal. Pectorals reaching ventrals. Caudal deeply forked, the lower lobe the longer, much longer than head. Belly totally scaleless (to anus). Scales carinate, slightly increasing in size towards the back. Caudal peduncle extremely slender, its height more than thrice in its length. Brown above, reddish below. Pectorals and ventrals brown above, lighter below. Caudal brown, with a whitish band and whitish tips. Length of single specimen known 85 mm. [Type of the species in the Leyden Museum seen by us].

Habitat: Borneo (river Bŏ).

4. Parhomaloptera Vaillant.

(VAILLANT, Notes Leyden Museum XXIV. 1902, p. 129).

Differs from *Homaloptera* in the presence of 8 very short and thick barbels, six in a horse-shoe shaped groove before the mouthopening, the end of which is forked at both sides in an outward direction. A very small barbel at the corner of the mouth. Lower lip bifid, foliaceous.

Distribution: The single species is known only from rivers in Borneo.

1. Parhomaloptera microstoma (Blgr.)

Homaloptera microstoma Boulenger, Ann. & Mag. Nat. Hist. (7) IV. 1899, p. 228.
Parhomaloptera obscura Vaillant, Notes Leyden Mus. XXIV. 1902, p. 130.
Parhomaloptera obscura Popta, Notes Leyden Mus. XXVII. 1906, p. 187.

D. 1—2.7; A. 1—2.5; P. 5—6.13; V. 1.9.1; L. l. about 100; L. tr. $\frac{17}{1}$.
$\frac{}{13}$

Height 6.2—7, 8—9 in length with caudal. Head much

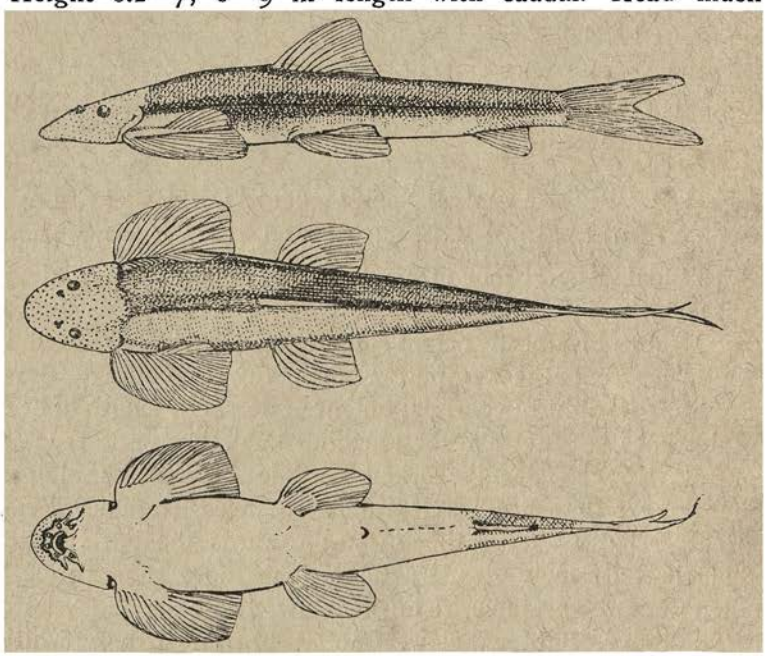

Fig. 5. *Parhomaloptera microstoma* (Blgr.) (After Vaillant).

depressed 5—5.4, 6.2—6.6 in length with caudal, its breadth about $^4/_5$ of its length. Eye 5.5—6, situated in the posterior

half of the head, about 2.7 in snout, 3 in interorbital space. Barbels shorter than eye. Origin of dorsal nearer to snout than to caudal. Anal small, far back, behind middle between tip of ventrals and origin of caudal, its origin opposite to about 70th scale of lateral line. Pectorals not reaching ventrals. Ventrals reaching anus. Caudal deeply emarginate, inferior lobe the longer, much longer than head. Lower surface naked, scaly only behind ventrals. Dark brown, yellowish below, as also the fins. Length 88 mm. [Types of *H. microstoma* Blgr. in the British Museum and of *P. obscura* Vaill. in the Leyden Museum seen by us].

Habitat: Borneo (Upper Mahakam!, river Bluu! and Akar river, Sarawak!).

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2. Fam. COBITIDAE.

Head and body compressed, exceptionally the anterior part of head depressed. Pectorals and ventrals not horizontally inserted, only one of their outer rays simple. A simple or bifid movable spine, arising from lateral ethmoid, may be present before or below eye. Eyes with a free orbital margin or covered by skin. Dorsal short or long, its origin before, above or behind that of ventrals; anal short, generally behind dorsal. Mouth inferior, its upper border formed by the intermaxillaries only. Six, eight or more barbels; always one or two pairs of rostral ones and one or two pairs of maxillary ones; there may be a pair of nasal or of mandibulary barbels. Scales small, minute or rudimentary. Lateral line incomplete or absent. Gillmembranes broadly united with isthmus. Gillopenings small or moderate, vertical or subvertical. No pseudobranchiae. Pharyngeal teeth in a single series, in moderate number. Anterior part of airbladder enclosed in a bony capsule, posterior part small or vestigial.

Distribution: Europe, Abyssinia, Asia, western part of indo-australian Archipelago, mostly in mountain streams.

Key to the genera of indo-australian Cobitidae.

I. A movable prae- or suborbital spine.

1. Origin of dorsal before that of ventrals.

a. Spine below eye; eyes with a free orbital margin. . . . . *Botia* p. 22.

b. Spine before eye; eyes covered by skin. . . *Acanthopsis* p. 24.

2. Origin of dorsal opposite to or behind that of ventrals.
   a. Scales below and behind eye and on opercles.
      1. Dorsal far behind ventrals; its last ray above anal; 8 barbels; one pair nasal . *Eucirrhichthys* p. 26.
      2. Dorsal above or behind ventrals, always before anal; 6 or 8 barbels, no nasal ones *Lepidocephalus* p. 27.
   b. Head without scales; six barbels . . . . . *Acanthophthalmus* p. 30.

II. Without prae- or suborbital spine.
   1. Nasal barbels present; head depressed . . . . . *Elxis* p. 35.
   2. No nasal barbels, head rounded or compressed.
      a. Dorsal very long, with more than 60 rays . *Vaillantella* p. 36.
      b. Dorsal short, with 20 or less rays . . . . . *Nemachilus* p. 38.

1. **Botia** Gray.

(Gray, Papers in Zool. Misc. 1841, p. 8).

Body oblong, compressed, with the dorsal profile more or less arched. Eyes with a free circular orbital margin. A bifid erectile spine before and partly below it. Mouth small, with thick lips. Six to eight barbels. Four anterior ones, united at

Fig. 6. *Botia hymenophysa* (Blkr.) × 4/5.
Only the bluish edges of the brown crossbars are visible.

their base, on the tip of the snout; a pair behind the corner of the mouth and sometimes a pair at the mandibular symphysis. Scales rudimentary, none on the head. Nostrils close together, nearly midway between eye and snout, the anterior ones tubular. Origin of dorsal in advance of the ventrals. Anal short. Pectorals low down, caudal forked. Pharyngeal teeth conical, in one series. Gillmembranes broadly united with the isthmus.

Distribution: Fresh water of indo australian Archipelago (Sumatra, Java, Borneo, Singapore); South-eastern part of continental Asia and Japan.

Key to the indo-australian species.

a. Eight barbels. D. 11—12. Head and body with three broad transverse bands . . . . . *B. macracanthus* p. 23.

b. Six barbels. D. 13—15. Body with 13—15 cross bars *B. hymenophysa* p. 24.

1. Botia macracanthus (Blkr).

Cobitis macracanthus Bleeker, Nat. Tijdschr. Ned. Indië, III. 1852, p. 603.
Hymenophysa macracanthus Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 62.
Botia macracanthus Bleeker, Atl. Ichth. III. 1863, p. 5.
Botia macracanthus Günther, Cat. Brit. Mus. VII. 1868, p. 368.
Botia macracanthus Volz, Zool. Jahrb. Abth. Syst. XIX. 1903, p. 405.
Botia macracantha Fowler, Proc. Acad. Nat. Sci. Philadelphia (2) LVII. 1905, p. 474.

B. 3; D. 11; A. 8; P. 14—16; V. 9.

Head 3, a little less than height. Eye 4 to more than 6, situated in the posterior half of the head. Suborbital spine about one and a half times the diameter of eye. Mouthopening horse-shoe shaped, the very small lower jaw totally inclosed within the upper jaw. Lips thick, lamellated. Eight verrucose barbels; besides the 4 rostral ones, one behind each angle of the mouth and two small ones at the mandibular symphysis. Origin of dorsal midway between end of snout and end of shortest caudal rays. Length of caudal peduncle $^2/_3$ of its greatest height. Yellowish brown with three broad transverse black bands, the first, narrow one, through the eye, the second before the dorsal, the third between posterior end of dorsal and anal, including both fins in older specimens. With growing age the median fins get also dark. Length over 300 mm.

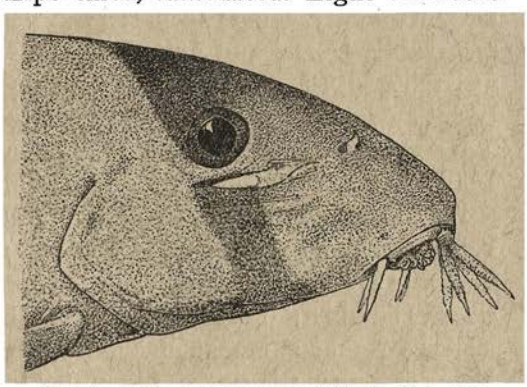

Fig. 7. *Botia macracanthus* (Blkr.). Nat. size.

Nomen indig.: Matjan (Malay. Sumatra); Getjuban (Lampong); Bidju bana (Djambi); Languli (Mahakam).

Habitat: Sumatra (Telok Betong, rivers Pangabuang, Musi

and its tributaries, Kwanten river!, Batang Hari!, Lake Manindjau); Borneo (rivers Barito, Kahajan, Kapuas, Bongan, Mahakam).

2. **Botia hymenophysa** (Blkr.) [Fig. 6, p. 22].

Cobitis hymenophysa Bleeker, Nat. Tijdschr. Ned. Indië, III. 1852, p. 602.
Hymenophysa MacClellandi Bleeker, Nat. Tijdschr. Ned. Indië XVI. 1858—1859, p. 358; Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 63.
Botia hymenophysa Bleeker, Atl. Ichth. III. 1863, p. 6.
Botia hymenophysa Günther, Cat. Brit. Mus. VII. 1868, p. 368.
Botia hymenophysa Volz, Zool. Jahrb. Abth. Syst. XIX. 1903, p. 406.
Botia hymenophysa Popta, Notes Leyden Mus. XXVII. 1906, p. 207.

D. 13—15; A. 8; P. 12—15; V. 8.

Elongate. Height nearly 4, head about $3^1/_3$. Eye 5—7, situated in the posterior half of the head. Suborbital spine about equal to eye. Mouthopening terminal, with the upper jaw slightly overlapping; the lips thick, partly lamellated or verrucose. Six barbels: four rostral ones, the inferior pair the shorter, one behind each angle of the mouth. Origin of dorsal nearer to base of caudal than to end of snout. Length of caudal peduncle about equal to its greatest height. Brownish, with 13—15 crossbars, with dark edges; in preserved specimens only these edges are visible. Dorsal and caudal with transverse bands, the former generally with a blackish blotch on its anterior superior angle. Length over 210 mm.

Nomen indig.: Langli (Pangabuang), Lelangli (Djambi), Seku (Kapuas), Buleng and Avemadjan (Mahakam).

Habitat: Java (Ngawi); Sumatra (Telok Betong, river Pangabuang, river Musi and its tributaries, river Kompeh, river Kwantan!, river Indragiri, river Kampar!, river Batang Hari!, river Djambi!); Borneo (Sarawak [British Museum], rivers Kapuas, Kahajan, Mahakam and their tributaries); Singapore. — Malay Peninsula [British Museum], Siam.

2. **Acanthopsis** Bleeker.

(Bleeker, Nat. Tijdschr. Ned. Indië, XVI. 1858—1859, p. 303).

Much elongate, compressed. Eyes covered by skin, in advance of them an erectile bifid suborbital spine. Head compressed, snout much elongate, mouth inferior, small. A pair of rostral barbels, close together at the point of the snout, a pair of separate barbels along each upper jaw, lower jaw with a fringed lip. Scales very minute, wanting on the head. Nostrils appro-

ximate, the anterior tubulate; before suborbital spine. Dorsal opposite to ventrals, its origin before them. Anal short, far

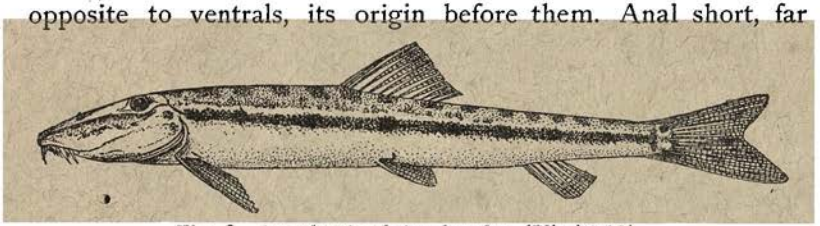

Fig. 8. *Acanthopsis choirorhynchus* (Blkr.) × 9/10.

behind dorsal, caudal emarginate. Gillopening a vertical slit ending before base of pectorals.

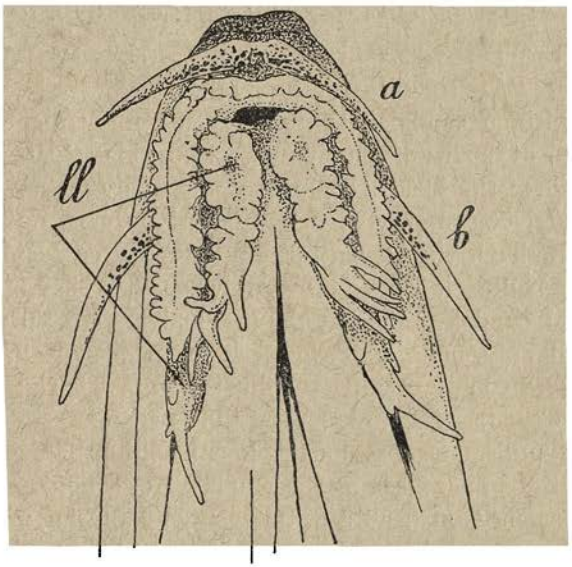

Fig. 9. Ventral surface of head of *Acanthopsis choirorhynchus* (Blkr.)
a. rostral barbel. *b*. anterior barbel of upper jaw. *ll*. lower lip with fringes, and at the corner of the month the posterior maxillary barbel. Much enlarged.

Distribution: Fresh water of indo-australian Archipelago (Sumatra, Java, Borneo) and south-eastern Asia.

1. **Acanthopsis choirorhynchus** (Blkr).

Acanthopsis dialyzona van Hasselt, Alg. Konst- en Letterbode 1823, II, p. 133 (no description).

Acanthopsis biaculeata Rüppell, Samml. des Senckenb. Mus. 1852, p. 28. [1])

1) This name is given by RÜPPELL without description with Kuhl as author. Probably it came from the Leyden Museum, which got the species, now under consideration, from KUHL & VAN HASSELT under this name, which has never been published. (Vide Bleeker Atl. Ichth. III. 1863, p. 9).

Cobitis choirorhynchus Bleeker, Nat. Tijdschr. Ned. Indië VII. 1854, p. 95.
Cobitis macrorhynchus Bleeker, l. c. — Act. Soc. Sc. Indo-Neerl. II. 1857. Tiende Bijdrage Borneo p. 20.
Acanthopsis choirorhynchos Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 66. — Atl. Ichth. III. 1863, p. 9.
Acanthopsis dialyzona Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 67. — Atl. Ichth. III. 1863, p. 9.
Acanthopsis choerorhynchus Günther, Cat. Brit. Mus. VII. 1868, p. 365.
Acanthopsis dialyzona Günther, l. c.
Acanthopsis choirorhynchus Day, Fishes of India 4°. 1878—1888, p. 608.
Acanthopsis choirorhynchus Vinciguerra, Ann. Mus. Civ. Genova (2) IX. 1890, p. 342.
Acanthopsis dialyzona Vaillant, Nouv. Arch. Mus. d'hist. nat. (3) V. 1893, p. 100.
Acanthopsis choirorhynchus Popta, Notes Leyden Mus. XXVII. 1906, p. 204.

D. 2.10—11; A. 2.5—7; P. 1.9; V. 1.6.

Height $8^1/_2$—10, $9^1/_2$—11 in total length. Head $4^2/_3$—$5^1/_3$ in length without caudal. Eye about 6—8, situated high up, in the last third of the head, when young with its hinderpart only in the last third of the head. Origin of dorsal midway between snout and caudal or somewhat more anteriorly. Dorsal its own length before anal. Origin of ventrals opposite to the second quarter or third of dorsal. Anal nearly midway between origin of ventrals and caudal. Pectorals about equal to two third of head. Caudal deeply emarginate, lower lobe conspicuously the longer. Colour of alcohol specimens yellowish brown, back with 12—14 dark crossbars. A dark lateral line with a series of from 8—12 round spots, less conspicuous in old specimens. A black spot at the upper base of the caudal. According to BLEEKER, the dark bands on head and back may be wanting in specimens from Borneo and Java (*A. macrorhynchus* Blkr.). Length about 180 mm.

Nomen indig.: Kili Kili Buaja (Djambi), Serowot and Djeller (Sundan.), Sĕkojok (river Bo, Borneo), Bau tanduk and Pêro (Upper Mahakam, Borneo).

Habitat: Sumatra (Deli, rivers Batang Hari!, Kwantan!, Lematang, Enim, Upper Langkat); Java (Batavia, river Brantas!, Kediri!); Borneo (rivers Kapuas, Kahajan, Bo, Mahakam). — Malay Peninsula, Burma, Annam.

3. **Eucirrhichthys** Perugia.

(PERUGIA, Annali Museo Civico Storia nat. Genova (2) XII (XXXII). 1892, p. 1009).

Very elongate, anguilliform, slender. Eyes covered by skin,

below them a strong bifid suborbital spine. Head rounded; snout rather long, bluntly rounded; mouth small inferior with lobate lips. Eight barbels, two nasal ones and six round the mouth. Scales minute, also present below eye, on praeoperculum and on upper half of the operculum. Dorsal short, far backward, its last ray above first ray of anal. Pectorals with the second ray slightly elongate, but conspicuously thickened. Ventrals very small, about thrice nearer to anus than to base of pectorals. Caudal slightly emarginate. Gillopenings subvertical, ending near base of pectorals.

Distribution: that of the single species known.

1. **Eucirrhichtys doriae** Perugia.

Eucirrhichthys Doriae Perugia, Ann. Mus. civ. stor. nat. Genova (2) XII. 1892, p. 1009.

D. 7; A. 6; P. 6; V. 6.

Height about 20 times in length with caudal, head nearly 10 times in that length. Eye very small, situated in the second third of the head. Barbels nearly equal in length with that of

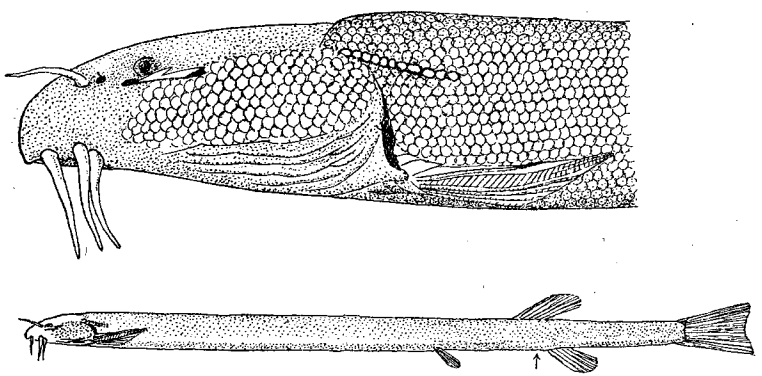

Fig. 10. *Eucirrhichthys doriae* Perugia × $1^1/_5$.
Head and anterior part of body magnified $5^1/_2$ times.

snout. Colour of alcohol-specimens uniform. Length 90 mm. [A cotype from the Museum of Genova seen by us].

Habitat: Borneo (Sarawak!).

4. **Lepidocephalus** Bleeker.

(*Lepidocephalus* Bleeker, Nat. Tijdschr. Ned. Indië XVI. 1858—1859, p. 303. — Atl. Ichth. III. 1863, p. 12; *Lepidocephalichthys* Bleeker, Atl. Ichth. III. 1863, p. 12).

Oblong or elongate, compressed, back not arched or slightly so. Eyes very small, covered by skin, below them an erectile, bifid spine. Mouth small, inferior, with thick, simple lips. Six or 8 barbels, two pairs rostral, one pair on the maxillaries and one pair on the mandibles, the last pair may be wanting. Scales minute, below and behind the eye, also on the opercles and on the vertex, the last may be wanting. Nostrils contiguous,

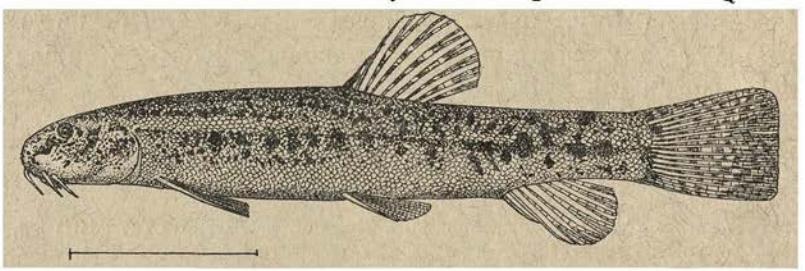

Fig. 11. *Lepidocephalus hasselti* (C. V.) × $2^1/_2$.

the anterior one small and tubulate. Origin of short dorsal opposite to base of ventrals or behind it. Anal short, behind dorsal. Pectorals falcate or rounded. Caudal truncate. Gillopenings a vertical slit above the base of the pectorals.

Distribution: Indo-australian Archipelago, (Sumatra, Java, Borneo); China, Southern India, Ceylon.

Key to the indo-australian species.

I. Vertex scaly. Six barbels.
  a. Origin of dorsal opposite to base of ventrals. Pectorals subfalciform . . . . . *L. pallens* p. 28.
  b. Origin of dorsal behind base of ventrals. Pectorals falcate . . . . . *L. macrochir* p 29.

II. Vertex without scales. Eight (or six) barbels.
  Origin of dorsal opposite to base of ventrals. Pectorals rounded . . . . . *L. hasselti* p. 29.

1. **Lepidocephalus pallens** (Vaill.).

Lepidocephalichthys pallens Vaillant, Notes Leyden Mus. XXIV. N°. 1—3, 1902, p. 153.

D. 3.8; A. 2.6; P. 9; V. 7; L. l. 181.

Height $5^1/_2$, head 5, vertex scaly. Snout $2^1/_4$ in head, 6 barbels, lower lip fringed. Eye about 20. Origin of dorsal slightly behind middle of length, nearly opposite to that of ventrals.

Pectorals emarginate behind, subfalciform. Coloration faintly red, slightly darker on the anterior dorsal part. Two black patches at base of caudal. Head whitish. Fins hyaline. Length of single specimen known 52 mm. [Type of the species in the Leyden Museum seen by us].

Habitat: Borneo (river Kapuas!).

2. Lepidocephalus macrochir (Blkr.).

Cobitis macrochir Bleeker, Nat. Tijdschr. Ned. Indië VII. 1854, p. 97.
Lepidocephalus macrochir Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 70. — Atl. Ichth. III. 1863, p. 12.
Lepidocephalus macrochir Günther, Cat. Brit. Mus. VII. 1868, p. 370.

D. 9; A. 6; P. 9; V. 6.

Very compressed. Height $6^1/_2$—7; head 6—$6^1/_2$, vertex scaly, rostro-frontal profile convex; snout blunt, prominent. Six barbels. The dorsal is situated in the beginning of the last third of the length, at some distance behind the base of the ventrals; its origin opposite to about the 110th scale of lateral line. Pectorals longer than head. Ventrals less than half length of pectorals. Coloration uniform. Length about 90 mm. [Type of the species in the British Museum examined by us].

Habitat: Java (Surakarta); Sumatra (Muara Enim).

In rivers.

3. Lepidocephalus hasselti (C. V.). [Fig. 11, p. 28].

Cobitis octocirrhus van Hasselt, Algem. Konst- en Letterbode 1823, II. p. 133, (insufficient description).
Cobitis Hasselti Cuvier & Valenciennes, Hist. Nat. Poissons XVIII. 1846, p. 74.
Cobitis Hasseltii Bleeker, Nat. Tijdschr. Ned. Indië XIII. 1857, p. 365.
Lepidocephalus Hasseltii Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 71.
Lepidocephalichthys Hasseltii Bleeker, Atl. Ichth. III. 1863, p. 13.
Lepidocephalichthys hasseltii Kner, Fische Novara-Exp. 1865—1867, p. 366. (sine Syn.).
Lepidocephalichthys hasseltii Günther, Cat. Brit. Mus. VII. 1868, p. 364.
Lepidocephalichthys Hasseltii Jordan & Seale, Proc. U. S. Nat. Mus. XXXIII. 1908, p. 537.

D. 8; A. 7; P. 8; V. 7; L. l. about 100.

Height 6—7, head $5^2/_3$—6. Eye much shorter than interorbital space, shorter than snout, which goes more than thrice in head. 8 barbels, the mandibulary ones, which are much shorter but thicker, sometimes wanting. Origin of dorsal opposite to end of base of ventrals. Pectorals rounded, longer than head. Yellowish brown, with smaller and larger irregular patches,

especially in the lateral line and on the back. There may be two black patches at the base of the caudal. Rays of dorsal and caudal with irregular rows of black spots, other fins hyaline. Length nearly 50 mm.

Nomen indig.: Sereni (Javan.), Serowot, Djeler (Sundan.).

Habitat: Sumatra (Deli!); Java (Batavia!, Buitenzorg!, Bandong!, lake Situ bagendit!, Tjilankahan, Perdana, Carut, Purworedjo). — Tenasserim (British Museum).

5. **Acanthophthalmus** Bleeker.

(BLEEKER, Nat. Tijdschr. Ned. Indië XVI. 1858—1859, p. 303).

(*Pangio* Blyth).

Elongate or very elongate, and anguilliform, compressed. Eyes covered by skin, below them an erectile bifid suborbital spine. Head more or less compressed, snout short, bluntly rounded; mouth small, inferior. Six barbels, two rostral ones close together near apex of snout, a pair on the upper jaw,

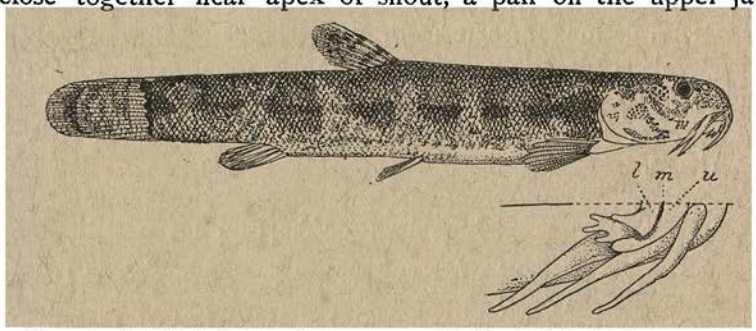

Fig. 12. *Acanthophthalmus lorentzi* n. sp. × 2½. Left half of lower surface of anterior part of head enlarged: *m* mouthopening, *u* upperlip, *l* lower lip.

an other pair on the lower jaw. Scales minute or scarcely visible, wanting on head. Nostrils close together, the anterior tubulate. Dorsal far backwards between ventrals and anal or above anal. Caudal rounded, truncate or slightly emarginate. Gillopenings subvertical, ending near base of pectorals.

Distribution: Fresh water of indo-australian Archipelago, (Sumatra, Java, Borneo, Singapore); Southern Shan States, Burma, Tenasserim and North east Bengal.

Artificial key to the indo-australian species.

I. Height 8—11 in total length with caudal.

A. Dorsal its own length or more before anal.

a. Ventrals in the middle between tip of snout and end of caudal or behind it.
  α. Colour uniform . . . . . *A. pangia* p. 31.
  β. Spotted . . . . . *A. shelfordi* p. 32.
b. Ventrals much nearer to tip of snout than to end of caudal . . . . . *A. lorentzi* p. 32.

B. Dorsal much less than its own length before anal or last ray even above first anal ray.
a. 12—15 transverse bands on head and body . . *A. kuhli* p. 33.
b. 3 bands on head only . . . . . *A. borneensis* p. 34.

II. Height 15 or more in total length.
a. Last dorsal ray above first anal ray . . . . . *A. vermicularis* p. 34.
b. Dorsal and anal opposite. . . . . *A. anguillaris* p. 35.

1. Acanthophtalmus pangia (Ham. Buch.).

Acanthopthalmus javanicus van Hasselt, Alg. Konst- en Letterbode 1823, II. p. 133. (no description).
Cobitis pangia Hamilton Buchanan, Fishes Ganges, 1824, p. 355, p. 394.
Cobitis oblonga Cuvier & Valenciennes, Hist. Nat. Poissons XVIII. 1846, p. 76.
Cobitis oblonga Bleeker, Act. Soc. Sc. Indo-Neerl. III. 1858, 6de Bijdrage Vischfauna Sumatra, p. 48.
Acanthophthalmus javanicus Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 75. — Atl. Ichth. III. 1863, p. 11.
Acanthophthalmus pangia Günther, Cat. Brit. Mus. VII. 1868, p. 370.
Acanthophtalmus pangia Day, Fishes of India 4°. 1878—1888, p. 610. — Fauna Brit. Ind. Fish. I. 1889, p. 222.
Acanthophthalmus pangia Vinciguerra, Ann. Mus. Civ. Genova (2) IX. 1890, p. 347.

D. 2.6; A. 7; P. 1.8—9; V. 6—7.

Compressed. Height from more than 7 to 11, head nearly 7—8. Eye small, covered by thick skin, situated in the anterior half of the head. Snout very prominent, rather pointed. Lips thick, the lower with two contiguous rounded prolongations. Barbels six, nearly equal, more than thrice in the length of the head. Origin of dorsal in the beginning of the last third of the distance between opercle and caudal. Dorsal about in the middle between anal and end of ventrals, its own length before

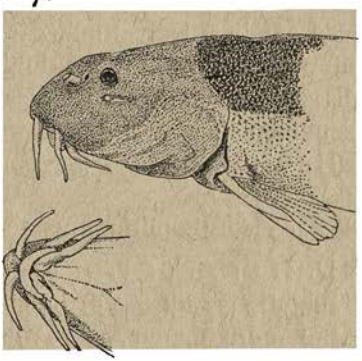

Fig. 13. Head and anterior part of body of *Acanthophthalmus pangia* (Ham. Buch.), and lower surface of anterior part of head. × 2½.

anal. Ventrals in the middle between tip of snout and end of caudal. Caudal slightly emarginate, shorter than head. Scales scarcely visible with the naked eye. Colour uniform reddish brown, lighter below. Length about 80 mm.

Nomen indig.: Sisi-samping, Serowot (Sundan.).

Habitat: Sumatra (river Lamatang, Deli!); Java (Buitenzorg, Tjandjur). — Southern Shan States, Burma and North east Bengal.

2. **Acanthophthalmus shelfordi** Popta.

Acanthophthalmus Shelfordii Popta, Notes Leyden Mus. XXIII. 1901—03, p. 231.

D. 6; A. 5; V. 6; L. l. 220.

Compressed. Height $8^1/_3$, head $6^2/_3$. Eye 10, situated in the anterior half of the head. Interorbital space a little convex, equal to eye. Profile of head convex. Snout prominent, $^1/_3$ of the length of the head. Underlip cloven. Six barbels, slightly longer than eye. Dorsal its own length before anal, near the end

Fig. 14. *Acanthophthalmus shelfordi* Popta (After Miss Popta). Nat. size.

of the third quarter of the length. Ventrals in the middle between snout and tip of caudal. Caudal truncate. Colour soft reddish; large irregular brown spots on back and sides of body in three rows, one on back and one at each side, spots on the head smaller. Dorsal and caudal with brown streaks, other fins soft reddish. Length of single specimen known 56 mm. [After Miss Popta, type of the species in the Leyden Museum seen by us].

Habitat: Borneo (Sarawak-river, near Kuchin!).

3. **Acanthophthalmus lorentzi** n. sp. [Fig. 12, p. 30].

D. 1. 6; A. 6; P. 1. 8; V. 7.

Slightly compressed, height about 7 in length with caudal. Head more than 5, more than 6 in length with caudal. Eye about 6. Snout about $1^1/_2$ times longer than eye, bluntly rounded and slightly prominent. Lips rather thin, the lower with a rather long, arborescent prolongation on each side. Six about equal barbels, about thrice in the length of the head. Origin of dorsal behind the middle of distance between eye

and caudal, opposite to the last third of ventrals, more than its own length before anal. Ventrals in the middle of the distance between tip of snout and base of caudal. Caudal truncate, equal to head. Scales scarcely visible with the naked eye. Yellowish, marmorated with brown, a dark median lateral line, composed of more or less connected brown spots, the first of which, behind the opercle, is the largest, crossed by about six faint brownish crossbands. Head with three irregular dark bands or patches before and behind eye. Dorsal and caudal with dark points, other fins hyaline. Length 40 mm. [Type in the Zoological Museum of Amsterdam].

Habitat: Borneo (Upper Kapuas!).

4. Acanthophthalmus kuhli (C. V.).

Acanthophthalmus fasciatus Kuhl, Alg. Konst- en Letterbode 1823, II. p. 133 (no description).
Cobitis Kuhlii Cuvier & Valenciennes, Hist. Nat. Poissons XVIII. 1846, p. 77.
Cobitis Kuhlii Bleeker, Nat. Tijdschr. Ned. Indië XIII. 1857, p. 364.
Acanthophthalmus fasciatus Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 74. — Atl. Ichth. III. 1863, p. 11.
Acanthophthalmus kuhlii Günther, Cat. Brit. Mus. VII. 1868, p. 371.
Acanthophthalmus kuhli Steindachner, Abh. Senckenb. Naturf. Gesellsch. XXV. 1901, p. 455.

D. 2.6—7; A. 1.5—6 or 2.5—6; P. 1.8; V. 1.5.

Compressed. Height 8—10 in length with caudal, head 8—9 in length without caudal. Eye 7—10, situated in the anterior half of the head. Convex interorbital space more than one eye diameter. Snout obtuse, convex, prominent. Lips thick, the inferior bilobate. Six nearly equal barbels, thrice or more than thrice shorter than head. Dorsal in the third fourth of the length, its end slightly before anal. Ventrals in the posterior half of length. Caudal truncate or slightly emarginate, about equal to head. Colour pink, 12—15 broad, brown transverse bands, the three anterior ones on the head, narrowing ventrally or nearly bifurcate. Fins pinkish; basal half of caudal brown. Length 80 mm. [Not seen by us].

Nomen indig.: Serowot (Sundan.).

Habitat: Sumatra (river Lamatang); Java (Batavia, Buitenzorg, Tjipanas, Penawangan); Borneo (rivers Kapuas, Baram); Singapore. — Malacca.

5. Acanthophthalmus borneensis Blgr.

Acanthophthalmus borneensis Boulenger, Ann. & Mag. Nat. Hist. (6) XIII. 1894, p. 251.

Acanthophthalmus borneensis Vaillant, Notes Leyden Mus. XXIV. N⁰. 1—3, 1902, p. 150.

D. 7—8; A. 6—7.

Height 9, head 6.5—7. Eye 8. Suborbital spine very strong. Six short barbels. Origin of dorsal about on the last third of the length, end of base of dorsal above or shortly before anal. Ventrals halfway between head and caudal. Caudal crescentically notched. Scales minute. Body colourless. Three black angular bands on the head, the first on the snout, the second passing through the eye, the third across the occiput and covering the opercles. Dorsal and caudal black at the base. Length 63 mm. [After BOULENGER and VAILLANT, specimens in the Leiden Museum seen by us].

Habitat: Borneo (Baram river and mouth of Raun river and river Mandai).

6. Acanthophthalmus vermicularis n. sp.

Acanthophthalmus anguillaris Max Weber & de Beaufort, in Maass: „Durch Zentral-Sumatra" II. 1912, Fische p. 533 (nec Vaillant).

D. 7—8; A. 7; P. 1.7; V. 6.

Compressed; height 18, 19 in length with caudal; head 10 in length without caudal. Eye 15, placed rather high, situated in the anterior half of the head. Snout about 5 times as long as eye, pointed, very prominent. Lips rather thick, the lower one on each side with a broad rounded prolongation. Six barbels, the two hinder ones the shortest, the longest more than thrice in the length of the head. Origin of dorsal in the beginning of the last fourth of the distance between point of snout and base of caudal, above anus. End of base of dorsal above the origin of the anal. Ventrals slightly less than half head, about in the beginning of the fourth fifth of the length. Pectorals less than half head. Caudal slightly emarginate, shorter than the head. Scales scarcely visible with the naked eye. Colour of alcohol specimen yellowish brown, a darker lateral band along the middle. Length of the single specimen known 70 mm. [Type of the species in the Zoological Museum of Amsterdam].

Habitat: Sumatra (river Kampar kiri!).

7. Acanthophthalmus anguillaris Vaill.

Acanthophthalmus anguillaris Vaillant, Notes Leyden Mus. XXIV. N°. 1—3, 1902, p. 151.

D. 2.6; A. 2.5; P. 8—9; V. 6.

Height 14, 15 in length with caudal; head 12, 13 in length with caudal. Eye 12, situated high above in the anterior half of the hoad. Snout about 4 times as long as eye, obtuse, rounded. Upper lip fleshy. Three pairs of barbels, the anterior rostral, the posterior at the end of the maxillaries, the third pair midway between them. Origin of dorsal just above anus, which is situated in third fourth of the body. End of dorsal above end of anal. Ventrals as long as half head, situated at the third fifth

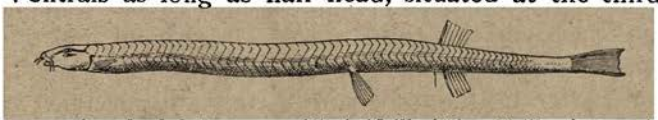

Fig. 15. *Acanthophthalmus anguillaris* Vaill. (After Vaillant) nat. size.

of the length of the body. Pectorals somewhat rudimentary. Caudal slightly emarginate, equal to head. Scales very small, more than 300 in lateral line. Colour of alcohol specimen pale rufous with minute dark punctuations; a dark band from snout through eye to praeopercle. Along the lateral line a more or less distinct dark band. Length 76 mm. [Type of the species seen in the Leiden Museum].

Habitat: Borneo (Kapuas!).

6. Elxis Jordan & Fowler.

(Jordan & Fowler, Proc. U. S. Nat. Mus. XXVI (1902) 1903, p. 768).

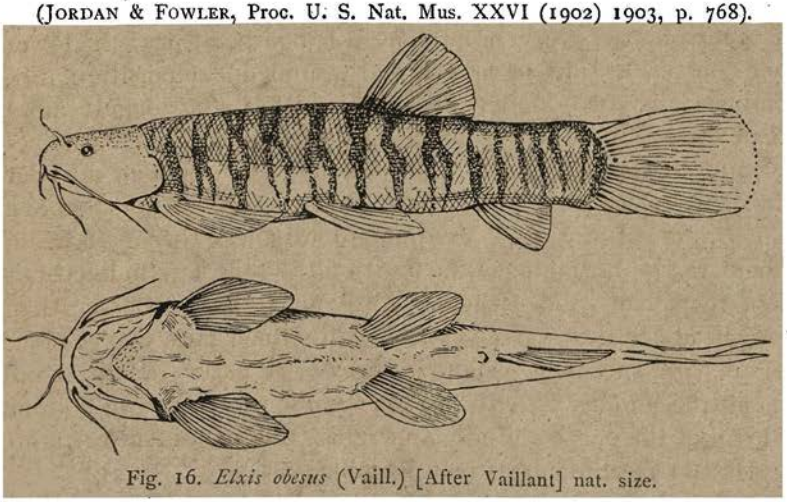

Fig. 16. *Elxis obesus* (Vaill.) [After Vaillant] nat. size.

Body elongate, compressed. Head elongate, broad, depressed. Snout broad, depressed, rounded and produced. Mouth inferior with fleshy lips. With four rostral, two maxillary and two nasal barbels. Eyes small with a free orbital margin. No suborbital spine. Origin of dorsal above or behind that of ventrals. Anal short, far behind ventrals. Caudal rounded or truncate with the lobes rounded. Scales rather moderate or minute. Gillopenings moderate, reaching conspicuously below origin of pectorals.

Distribution: Fresh water of Indo-australian Archipelago (Borneo). — Japan, Burma, Assam and Sikkim.

1. **Elxis obesus** (Vaill.) [Fig. 16, pag. 35].

Nemacheilus obesus Vaillant, Notes Leyden Mus. XXIV. 1902, p. 134.
Nemachilus obesus Popta, Notes Leyden Mus. XXVII. 1906, p. 202.

D. 2.7; A. 2.5; P. 1.12; V. 9; L. l. 130; L. tr. $\frac{24}{1}$.
$\frac{}{28}$

Height 5, six in length with caudal. Head 4.6, 5.7 in length with caudal. Eye 8.5, 4.5 in interorbital space and 3.5 in snout. Anterior and posterior nostrils close together, separated by a barbel about thrice longer than eye and sometimes bifurcate. Inner pair of rostral barbels the shortest, outer pair the longest, reaching not quite to end of operculum, those at the corner of the mouth shorter. Origin of dorsal nearer to caudal than to end of snout, far behind origin of ventrals. Dorsal rounded, its height less than that of the body. Origin of anal midway origin of ventrals and base of caudal. Anal much nearer to ventrals than to caudal, its height less than that of dorsal. Origin of ventrals in the middle of the length of the body. Pectorals rounded, somewhat shorter than head. Caudal rounded. Scales conspicuous. Reddish, lighter below, sides with about a dozen single or double dark vertical bands, narrower than their interspaces. Rays of fins brownish. Base of caudal with a brown band. Length more than 100 mm. [Type of the species in the Leiden Museum seen by us].

Nomen indig.: Dĕkat (Howong); Bamitoh (Bluu).

Habitat: Borneo (rivers Howong, Bluu!, Long Bluu, Bŏ, Kajan).

7. **Vaillantella** Fowler.

(Proc. Acad. Nat. Sci. Philadelphia LVII. 1905, p. 474).

Elongate. Dorsal very long, with more than 60 rays. Pect-

orals and ventrals very low down. Caudal deeply forked. Six barbels, four rostral ones, two at corner of mouth. Nostrils contiguous, the anterior a tube. Eyes with a free orbital margin. No suborbital spine. Scales very small. No scales on head.

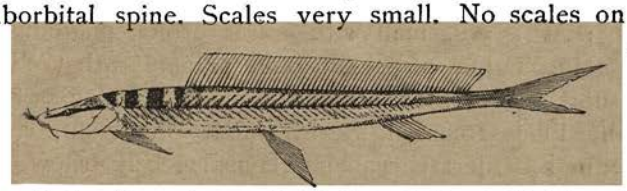

Fig. 17. *Vaillantella euepipterus* (Vaill.) [After Vaillant]. Slightly enlarged.

Lateral line present. Gillopenings narrow, before base of pectorals. Gillmembranes confluent with the isthmus.

Distribution: Borneo and Sumatra.

Key to the species.

1. Dorsal 64; Anal 7 . . . . . *V. euepipterus* p. 37.
2. Dorsal 73; Anal 15. . . . . *V. maassi* p. 38.

1. Vaillantella euepipterus (Vaill.).

Nemacheilus euepipterus Vaillant, Notes Leyden Mus. XXIV. 1902, p. 137.

D. 64; A. 7; P. 1.11; V. 10; L. l. circa 215.

Elongate, more or less rounded; height 10.3, 11.5 in length with caudal. Head 5.6, 6.2 in length with caudal. Eye 11, thrice in snout and $1^1/_2$ in interorbital space. Snout obtuse. Barbels filiform, subequal, longer than eye. Anterior nostrils in a tube. Origin of dorsal just in the beginning of the second third of the body, much nearer to base of pectorals than to that of ventrals; its last ray, when depressed, reaching caudal. Anal nearer to ventrals than to caudal, somewhat nearer to base of ventrals than to base of caudal. Pectorals somewhat longer than head without snout. Ventrals surpassing anus with about half their length, about equal to pectorals. Anus somewhat behind middle of length of body. Caudal deeply forked, upper lobe much longer, much shorter than head. Rufous, lighter below. Two parallel whitish bands from the snout passing above the orbits and united on the neck, continued into a transverse band on the back behind the branchial openings. Three or four less regular light bands before the dorsal. A black band from snout through eye to lateral line. Length about 70 mm. [Type of the species in the Leiden Museum seen by us].

Habitat: Borneo (River Kapuas!).

2. Vaillantella maassi M. Web. & de Bfrt.

Vaillantella maassi Max Weber & de Beaufort, in: A. Maass „Durch Zentral Sumatra" II. 1912, Fische p. 532.

D. 73; A. 15; P. 10; V. 8.

Elongate, compressed; height 11, 14 in length with caudal; head $6^2/_3$, 8 in length with caudal. Eye 8, $2^2/_5$ in snout and $1^1/_2$ in interorbital space. Snout prominent, round, in middle of its top a pair of short rostral barbels, about equal to eye, above and slightly outside of them a second somewhat longer pair, a third pair of barbels at the corner of the mouth, longer than half snout. Posterior nostrils oval, anterior nostrils a voluminous tubule, contiguous with the former. Origin of

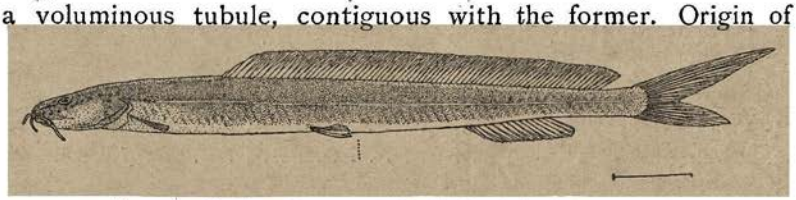

Fig. 18. *Vaillantella maassi* M. Web. & de Bfrt. nat. size.

dorsal before the beginning of the second third of the length of the body, much nearer to base of pectorals than to that of ventrals; last dorsal ray nearly reaches caudal. Anal twice as near to caudal than to ventrals. Ventrals equal to pectorals, reaching anus, which is situated nearly in the middle of the length of the body. Pectorals $1^1/_2$ in length of postorbital part of head. Caudal deeply forked, lobes pointed, upper lobe one third longer than lower one, $1^1/_2$ times length of head. Cycloid scales very small, lateral line conspicuous. Uniform brown. Length of single specimen known 98 mm. [Type of the species in the Zoological Museum of Amsterdam].

Habitat: Sumatra (Gunung Sahilan on river Kampar kiri!).

8. Nemachilus Bleeker.

(BLEEKER, Versl. Akad. Amsterdam, Dec. 1862, XV. 1863, p. 37) [1]).

Elongate, feebly compressed. Eyes with a free orbital margin; no suborbital spine. Head rounded, with blunt short snout; mouth small, inferior with a circular lip. Six barbels: a pair of rostral ones close together on the top of the snout, two pairs on the

1) The generic name *Nemachilus* is from VAN HASSELT (Alg. Konst- & Letterbode II. 1823, p. 133) but without description.

upper jaw. Dorsal opposite to ventrals or just behind the vertical through the origin of the latter. Anal short, far behind ventrals.

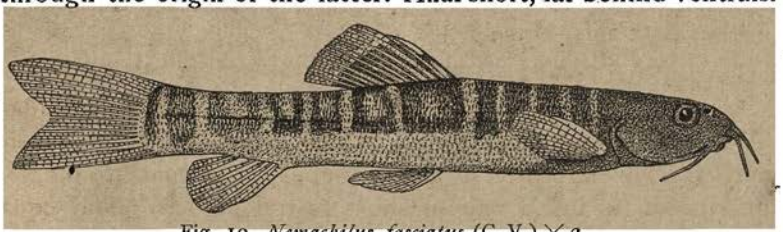

Fig. 19. *Nemachilus fasciatus* (C. V.) × 2.

Caudal emarginate or entire. Scales minute, wanting on head. Gillopenings subvertical, ending near base of pectorals.

Distribution: Europe, Asia, a single species in Africa.

Key to the indo-australian species.

1. Ventrals surpassing anus; outer pectoral rays prolonged, much longer than head. . . . . *N. longipectoralis* p. 39.
2. Ventrals not reaching anus; pectorals shorter than head. Caudal deeply emarginate . . . . . *N. fasciatus* p. 40.
3. Ventrals reaching anus; pectorals shorter than head; caudal feebly notched . . . . . *N. olivaceus* p. 41.

Doubtful species . . . . . *N. notostigma* p. 42.

1. **Nemachilus longipectoralis** Popta.

Nemachilus longipectoralis Popta, Notes Leyden Mus. XXV. 1905, p. 182. — ibid. XXVII. 1906, p. 198.

D. 3.9; A. 3.6; P. 2.10; V. 1.7.

Height 6—6.6, 7.8—8.8 in length with caudal. Head 4—4.2, 5.3—5.5 in length with caudal. Eye about 4, one third shorter than snout, slightly less than interorbital space. Inner rostral barbels reaching to about middle of eye, outer ones to middle of operculum, those at corner of mouth somewhat shorter. Origin of dorsal nearer to end of snout than to caudal, before origin of ventrals. Dorsal oblique, its height about equal to head. Anal oblique, its height less than that of the dorsal and equal to that of the ventrals, its origin nearer to caudal than to origin of ventrals. Ventrals shorter than head, surpassing anus, their origin is opposite to the second branched ray of the dorsal. The two outer articulated rays of pectorals prolonged, surpassing base of ventrals, much longer than head. Caudal deeply emarginate, lobes pointed with rounded tips, the upper

one the longer, much longer than head. Scales conspicuous, about 100 in the lateral line. Colour, after Miss POPTA, yellowish, with 12—14 transverse brown narrow bands on the back, which are continued on the flanks, where some of them divide so as to form 16—18 bands on the flanks. Dorsal rays with brown spots, caudal with 2 or 3 brown curved lines and a dark blotch at the middle of its base. Length 50 mm.

Nomen indig.: Ikan skuoro (Upper Mahakam).

Habitat: Sumatra (Taluk!); Borneo (Upper Mahakam).

2. **Nemachilus fasciatus** (C. V.) [Fig. 19, p. 39].

Cobitis fasciata Cuvier & Valenciennes, Hist. Nat. Poissons XVIII. 1846, p. 25.
Cobitis suborbitalis Cuvier & Valenciennes, ibid. p. 26.
Cobitis chrysolaimos Cuvier & Valenciennes, ibid. p. 27.
Cobitis Jaklesi Bleeker, Nat. Tijdschr. Ned. Ind. III. 1852, p. 604. — Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 80.
Cobitis Pfeifferi Bleeker, Nat. Tijdschr. Ned. Ind. IV. 1853, p. 298.
Cobitis fasciata Bleeker, Nat. Tijdschr. Ned. Ind. VII. 1854, p. 96. — Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 78.
Nemacheilus fasciatus Bleeker, Atl. Ichth. III. 1863, p. 7.
Nemacheilus Jaklesi Bleeker, Atl. Ichth. III. 1863, p. 8.
Nemacheilos fasciatus Kner, Novara-Exp. I. Fische 1865—67, p. 366.
Nemachilus fasciatus Günther, Cat. Brit. Mus. VII. 1868, p. 349.
Modigliania papillosa Perugia, Ann. Mus. Civ. Genova (2) XIII. 1893, p. 246 [1]).
Nemachilus saravacensis Boulenger, Ann. Mag. Nat. Hist. (6) XIII. 1894, p. 251 [1]).
Nemachilus rupicola Vaillant, Notes Leyden Mus. XXIV. 1902, p. 31 [1])

D. 3.9; A. 3.5; P. 2.9; V. 1.7.

Height 6—6.2, 7.4—8 in length with caudal. Head about 4.5, about 5.5—6 in length with caudal. Eye 5 to 6, more than twice in snout, about $1^1/_3$ in interorbital space. Inner rostral pair of barbels shorter than the outer ones, which are about equal to those at the corner of the mouth and equal to half head. Origin of dorsal nearer to end of snout than to base of caudal, slightly before or above origin of ventrals. Dorsal oblique, its height nearly equal to head. Anal rounded, its height less than that of dorsal, its origin about midway between origin of ventrals and caudal. Ventrals not reaching anus, shorter than head, equal to pectorals. Caudal deeply emarginate, its lobes pointed, caudal much longer than head. Scales small but conspicuous, about 130 in the lateral line and about 50 in front of dorsal. Body with from 11 to 20 cross-

1) See note on page 41.

bands on the back. A black interrupted band at the root of the caudal. Dorsal rays with series of black spots. Anterior dorsal rays often with a larger one. Length about 90 mm.

Nomen indig.: Djeler (Sundan.); Utjeng (Javan.).

Habitat: Sumatra (Air Runding! [Padangsche Benedenlanden], Solok, Kaju tanam!, Fort de Kock!, Lake Manindjau!, Pajakombo, Lahat, Taluk!, Danau near Sakaranda, Lake Toba!); Batu Islands?; Java (Bantam, Lebak, Batavia, Tjampea, Buitenzorg!, Sindanglaja, Tjandjur, Tjikoppo, Tjipanas, Tjisaat!, Garut, Gombong, Lake Situ Bagendit, Kuningan, Lake near Trogon!, Ambarawa, Malang, Cave Guwå gremeng near Djocja!, Tjilatjap, Ngantang, Lesti, Lawang!, Djember!); Borneo (river Kapuas, Danau Sriang, Sarawak).

Note. We have included *N. saravacensis* in the synonymy of *N. fasciatus* as the differences, given by BOULENGER, do not hold good. The difference in the number of the dorsal rays is not noteworthy. We find in specimens of *N. fasciatus* (from Java) the origin of the dorsal above the origin of the ventrals or slightly before them, but never behind.

After inspection of the young specimens in the Leiden Museum, which VAILLANT calls *Nemachilus rupicola* Mc Clell. whitout giving any reason for this definition, we believe that they belong to *Nemachilus fasciatus* C. V.

Dr. GESTRO, Director of the „Museo Civico" of Genova has been kind enough to send us two typical specimens of *Modigliania papillosa* Perugia. We are obliged to unite it with *Nemachilus fasciatus*, as we cannot see the "papilla grossa conica, lunga meta il diametro dell' occhio alla regione praeorbitale" and otherwise there is no difference from *Nemachilus fasciatus*.

3. **Nemachilus olivaceus** Blgr.

Nemachilus olivaceus Boulenger, Ann. Mag. Nat. Hist. (6) XIII. 1894, p. 250.

D. 3.8; A. 2.5; P. 10; V. 1.6.

Height 5.6, 7 in length with caudal. Head 4.5, 5.6 in length with caudal. Eye 5, twice in length of snout, about $1^1/_5$ in interorbital space. Inner rostral pair of barbels shorter than the outer ones, extending to middle of operculum. Origin of dorsal originating above the base of the ventrals, and slightly nearer the end of the snout than the base of the caudal. Height of dorsal somewhat less than length of head. Anal halfway

between dorsal and caudal, originating midway between origin of ventrals and caudal or a little nearer to ventral; its height scarcely less than that of dorsal. Ventrals reaching anus, shorter than head and scarcely shorter than pectorals. Caudal feebly notched. Body entirely covered with imbricate scales, of which there are about 30 between dorsal and ventral fins. Olive above, with or without traces of 17 darker bars across the back, yellowish beneath; fins gray or grayish, without spots. Total length 85 mm.

Habitat: Borneo (Bongon!).

Note: This species, the types of which have been studied by us in the British Museum is hardly different from *N. fasciatus* (C. V.). The only differences are, that the caudal fin is feebly notched in *N. olivaceus*, deeply emarginate in *N. fasciatus*, that in the former the ventrals reach the anus, which is not the case in *N. fasciatus*. The latter species has also a series of black spots on the dorsal rays, which are wanting in *N. olivaceus*.

Doubtful species.

1. Nemachilus notostigma Blkr.

Nemachilus notostigma Bleeker, Versl. Akad. Amsterdam XV. 1863, p. 254.
Nemachilus notostigma Günther, Cat. Brit. Mus. VII. 1868, p. 352.

D. 2.8; A. 3.5—6; P. 1.9; V. 1.6—7.

Height $7^1/_2$—8 in total length, head more than 5 in length. Eye about $5^1/_2$, more than once in interorbital space, situated about in the middle of the length of the head. The snout being somewhat shorter than the postorbital part of the head. Outer rostral barbels longer than inner ones and reaching to eye; maxillary barbels surpassing eye. Dorsal slightly oblique, straight, with the anterior corner rounded, anterior rays opposite to ventrals. Anal acute, its distance from end of dorsal, more than half length of last named fin. Ventrals inserted before middle of length. Pectorals not much shorter than head. Caudal distinctly emarginate. The free portion of the tail is, after GÜNTHER, as long as deep. Body with twelve or thirteen brownish crossbands, broader than the interspaces between them; base of caudal with a blackish transverse streak. Dorsal with a blackish spot at its anterior base, the rays with two to four black dots, as also the caudal rays. Length, as far as published 71 mm.

Habitat: Sumatra (Benkulen, according to E. VON MARTENS). — Ceylon.

We have placed this species under the doubtful ones, as we doubt, that E. VON MARTENS (Preuss. Expedition nach Ost-Asien, Zoolog. Theil, I. 1876, p. 404) was right in his determination of the species (of which he gives no description) of *Nemachilus*, caught by him in Benkulen, Sumatra, a species only known from Ceylon.

Note:

BLEEKER described (Nat. Tijdschr. Ned. Ind. II. 1851, p. 435) a *Cobitis barbatuloides*. In his diagnosis he says: "spinis suborbitalibus utroque latere 2, sub oculi margine anteriore vel vix ante oculum sitis, spina posteriore anteriore majore; cirris 6? brevibus...." Later on in a review of the Cobitinae (Nat. Tijdschr. Ned. Ind. XVI. 1858—59, p. 302) he gives the following diagnosis of his genus *Cobitichthys*: "Oculi velati. Cirri 6 ad 10, rostrales 2, supramaxillares 4. Caput alepidotum. Spina suborbitalis nulla. Nares anteriores tubulatae. Pinna dorsalis ventralibus opposita. Vesica natatoria parva tota in cavitate ossea vertebrali inclusa. Corpus valde compressum. Spec. archip. *Cobitis barbatuloides* Blkr." This changement of his opinion about the suborbital spine is explained in: Ichth. Arch. Prodom. II Cyprini, 1860, p. 82. In his Atl. ichth. III. 1863, p. 14 the species in question is called *Misgurnus barbatuloides* Blkr. As also the number of barbels is uncertain and BLEEKER himself says: "l'espèce mérite d'être examiné de nouveau," we only draw attention to it, but dare not to give a description.

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3. Fam. CYPRINIDAE.

Head and body compressed, exceptionally depressed. Pectorals and ventrals only in few cases horizontally inserted, only one of their outer rays simple. No spine before or below eye. Eyes with a free orbital margin, which may form a gelatinous eyelid. Dorsal short or long, its origin before, above or behind that of ventrals; anal short or long, its origin below dorsal or behind it. Mouth inferior or terminal, its upper border formed by the intermaxillaries only. Never more than two pairs of barbels: a rostral and a maxillary pair, one or both may be absent. Arrangement of lips and jaws and their covering

different. In indo-australian species scales present, large, moderate or small. Lateral line generally complete. Gillopenings generally wide, but gillmembranes broadly united with isthmus. Pseudobranchiae present. Pharyngeal teeth in one, two or three series, absent only in *Gyrinocheilus*. Airbladder divided into two portions, the posterior of which may be reduced, the anterior in indo-australian species not enclosed in bone.

Distribution: Fresh water of Europe, North America, Africa, Asia, western part of indo-australian Archipelago.

Artificial key to the indo-australian subfamilies of the Cyprinidae.

I. Abdomen, or part of abdomen, compressed into an edge *Abramidinae* p. 44.

II. Abdomen not compressed into an edge, rounded or even flattened.

1. Lower jaw generally with a symphysial knob, fitting in an incision of the upper one; dorsal without osseous spine, situated behind ventrals; lateral line abruptely bending downwards, if complete running along lower half of tail . . . . . *Rasborinae* p. 58.

2. Lower jaw always without symphysial knob; dorsal generally with an osseous spine, situated before or above ventrals; if behind them, the dorsal has a strong osseous spine; lateral line running, with one exception, in the middle of the tail . . . . . *Cyprininae* p. 89.

1. Subfam. Abramidinae.

Oblong, elongate or very elongate, compressed or much compressed; abdomen or part of abdomen compressed into an edge. Dorsal short with 7—10 branched rays, opposite to space between ventrals and anal or opposite to anal; without an enlarged spine, or the 3rd ray may be osseous and smooth, in one case serrated behind. Anal moderate or very long, with 12—48 branched rays. Ventrals in one case absent, pectorals may be elongate. Caudal forked. Mouth terminal, subinferior or directed upwards, with the lower jaw prominent, which may have a symphysial knob. No barbels or exceptionally a pair of maxillary ones. Scales small or of moderate size, the lateral line running in the middle or in the lower half of the tail. Gill-openings reaching to below orbit or praeoperculum. Pharyngeal teeth in a single, double or triple series.

Key to the indo-australian genera of Abramidinae.

A. Ventrals always present.
- I. A pair of long maxillary barbels present. . . . *Nematabramis* p. 45.
- II. No barbels.
  - *A.* A trenchant edge from throat to anus.
    - 1. Nuchal scales beginning far behind eyes; lateral line may be abruptely bent downwards above pectorals . . . . . *Laubuca* p. 47.
    - 2. Nuchal scales beginning above eyes; lateral line gently curved.
      - *a.* Pectorals situated above the ventral profile, which is convex in its whole length . . . . . *Chela* p. 50.
      - *b.* Pectorals situated in the ventral profile, which is convex only in its praepectoral part . . . . . *Macrochirichthys* p. 53.
  - *B.* A trenchant edge between base of ventrals and anus only. . . . . *Rasborichthys* p. 55.

B. No ventrals . . . . . *Parachela* p. 57.

1. Nematabramis Boulenger.

(Boulenger Ann. Mag. Nat. Hist. (6) XIII. 1894, p. 249).
Mearnsella Seale & Bean, Proc. U. S. Nat. Mus. XXXIII. 1908, p. 231.
Nematabramis L. S. Berg, Annuaire du Mus. Zool. St. Pétersbourg XIV. 1909, p. 43.

Oblong, much compressed, with a trenchant ventral edge. Upper profile slowly ascending from snout to dorsal, somewhat convex, slightly concave on head and nape. Gape of mouth

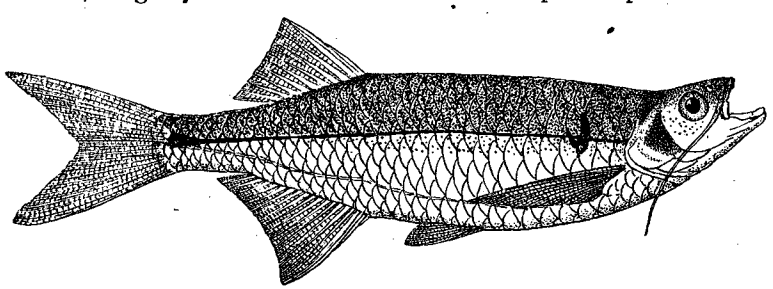

Fig. 20. *Nematabramis steindachneri* Popta. about × 5/1.

moderately large, obliquely directed upwards; lower jaw slightly longer than the upper one, which is protractile. A more or less developed symphysial knob, fitting in a corresponding shallow

cavity in the upper jaw. A pair of long maxillary barbels. Eye with a free orbital margin. Short dorsal, without strong spines, totally opposite to anal, which is much longer than dorsal and has 12—18 rays. Ventrals inserted slightly above the abdominal profile, with 6 branched rays, separated by one scale from the lateral line. Pectorals longer than head. Caudal deeply emarginate. Scales rather large, of about equal size, the nuchal ones commencing far behind eye. Lateral line abruptly bent downwards behind the pectoral fin and running close to the lower profile of the body and separated from it by 2 scales. Pseudobranchiae present. Gillrakers short. Pharyngeal teeth hooked, in two series 5.4—4.5. Branchial opening reaching below eye.

Distribution: Philippines and Borneo.

Key to the indo-australian species.

1. Height $3^1/_4$ to nearly $3^3/_4$; origin of dorsal twice as far from end of snout as from base of caudal. . . . *N. everetti* p. 46.
2. Height $3^6/_7$—$4^1/_6$; origin of dorsal less than twice as far from end of snout as from base of caudal . . *N. steindachneri* p 47.

1. Nematabramis everetti Blgr.

Nematabramis Everetti Boulenger, Ann. Mag. Nat. Hist. (6) XIII. 1894, p. 250.

D. 2.8; A. 3.16; P. 1.10; V. 1.5; L. l. 35—37; L. tr. $\frac{6\frac{1}{2}}{1\frac{1}{2}}$ (at origin of dorsal).

Height $3^1/_4$ to nearly $3^3/_4$ about 4.6 in length with caudal; head 4.3, 5.4 in length with caudal. Eye 3.6, shorter than snout and than interorbital space. Barbels $1^1/_2$ to 2 as long as head. Origin of dorsal above the 20th scale of lateral line, separated by 24 scales from occiput, twice as far from end of snout as from base of caudal. Height of dorsal slightly more than length of head without snout. Origin of anal below 18th scale of lateral line, its height somewhat more than that of dorsal. Ventrals a little nearer to end of snout than to base of caudal. Pectorals $1^1/_3$ as long as head, extending beyond base of ventrals. Least height of caudal peduncle more than twice in length of head and 1.7 in its own length, surrounded by 12 scales. Colour pale, with a silvery lateral stripe. Length 110 mm. [Type of the species in the British Museum seen by us].

Habitat: Borneo (Bongon and Merabeh, Baram River, Sarawak!).

2. **Nematabramis steindachneri** Popta. [Fig. 20, pag. 45].

Nematabramis Steindachnerii Popta, Notes Leyden Mus. XXV. 1904—1905, p. 179. — ibid. XXVII. 1905—1906, p. 176.

D. 2.9—10; A. 3.16—17; P. 1.12; V. 1.6; L. l. 37—38; L. tr. $\frac{6\frac{1}{2}}{1}$.

Height $3^6/_7$—$4^1/_6$, head $4^7/_{11}$—$4^5/_6$. Eye $4^1/_5$, $^5/_8$ in inter-orbital space. Mouth obliquely ascending, lower jaw, which is the longer, with a symphysial protuberance, corresponding to a small cavity in the upper jaw. Barbels $1^1/_4$ the length of the head, and reaching somewhat farther than the base of the pectorals. Origin of dorsal above 5th ray of anal, separated by 24 scales from occiput, slightly in advance of the second third of the length. Anal emarginate, the anterior rays the longest, beginning in the third fifth of the length. Ventrals not reaching anal, half their length distant from it. Pectorals falcate, pointed, equal to $^1/_4$ of the length of the body, surpassing base of ventrals. Caudal deeply emarginate, the lobes pointed, somewhat longer than head. Yellowish brown, back dark, an irregularly broad longitudinal dark band from opercle to caudal, ending in a triangular patch and containing a blotch above the first third of the pectorals. A median dark band on the back. Fins hyaline. Length over 140 mm. [After Miss Popta; specimen in the Leiden Museum seen by us].

Nomen indig.: Lalang (Kajan).

Habitat: Borneo (river Kajan!).

2. Laubuca Bleeker.

(Bleeker, Nat. Tijdschr. Ned. Indië XX. 1859—1860, p. 438. — Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 468).

(*Eustira* Günther).

Oblong, strongly compressed. A regularly convex trenchant edge from throat to anus. Dorsal profile slightly convex, mouth obliquely directed upwards. No hook at mandibular symphysis, nor an emargination at the symphysis of the upper jaw. No barbels. Eye with a free orbital margin. Dorsal short, without strong spines, its origin opposite to that of anal, which is many-rayed and much longer than dorsal. Ventrals inserted slightly above the abdominal edge, situated distinctly before middle of length, their outer ray elongated. Pectorals longer than head. Caudal forked. Scales rather large, of about equal

size, the nuchal ones commencing far behind eye. Lateral line curved downward and approximated to ventral profile. Pseu-

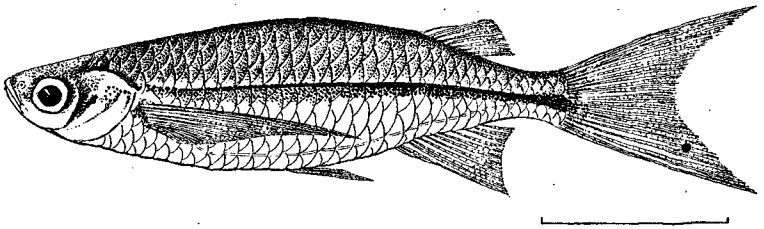

Fig. 21. *Laubuca* (*Eustira*) *maassi* (M. Web. & de Bfrt.) × 2½.

dobranchiae present. Pharyngeal teeth uncinate, in 3 rows. Branchial opening ending below eye.

Distribution: Sumatra, Ceylon and south eastern Asia.

Key to subgenera.

1. Lateral line gently curved downward . . . . . *Laubuca* s.str. p. 48.
2. Lateral line abruptly curved downward . . . . . *Eustira* p. 49.

Note: We do not think, that the Genus *Eustira* of Günther is generically distinct from *Laubuca*, we therefore give it only the value of a subgenus, containing *Eustira ceylonensis* Gthr. and our *Eustira maassi*.

1. **Laubuca (Laubuca) laubuca** (Ham. Buch.).

Cyprinus laubuca Hamilton Buchanan, Fishes of the Ganges, 1822, p. 260.
Perilampus guttatus M'Clelland, Ind. Cypr. 1839, p. 394.
Leuciscus laubuca Bleeker, Verh. Bat. Gen. XXV. 1853. Nalez. fauna Bengalen en Hindostan p. 138.
Chela laubuca Günther, Cat. Brit. Mus. VII. 1868, p. 335.
Perilampus laubuca Day, Fishes of India 4°. 1878—1888, p. 598.
Perilampus laubuca Duncker, Mitt. Naturhist. Mus. Hamburg, XXIX. 1912, p. 267. (sine syn.).

D. 2.8; A. 2.19; P. 1.11; V. 1.6; L. l. about 32—34; L. tr. $\frac{6\frac{1}{2}}{1}$.
$\frac{}{5}$

Dorsal profile convex behind a nuchal concavity, that of head straight. Abdominal profile convex from snout to anus, with a trenchant keel. Height 3.2—3.6, 4.1—4.6 in length with caudal. Head 4 or somewhat more, about 5½ in length with caudal. Eye nearly 3, somewhat longer than snout and than flat interorbital space. Gape of mouth obliquely ascending, not reaching to level of lower border of eye. Origin of dorsal

opposite to 5th branched ray of anal, separated by 18 or 19 scales from occiput, its distance from occiput about equal to that from end of middle caudal rays. Height of dorsal nearly equal to length of head. Anal emarginate, the height of its anterior rays about $^1/_5$ shorter than height of body. Ventrals with the outer ray filiform, reaching on anal, its length equal to $^4/_5$ of height of body, separated by 3 scales from lateral line. Pectorals falcate, pointed, $^1/_3$ longer than head, reaching to anus. Caudal deeply incised, its lobes pointed, elongate, about $^1/_4$ of total length. Lateral line gently curved downward to near ventral profile. Small gular scales reaching below pectorals to ventrals. Brown, a blackish line connecting a dark blotch above origin of pectorals with a similar one at base of caudal. Fins hyaline. Length over 60 mm.

Habitat: Sumatra (Deli!). — Burma, Assam, British India and Ceylon. In ponds and streams.

2. **Laubuca (Eustira) maassi** (M. Web. & de Bfrt.). [Fig. 21, p. 48].

Eustira Maassi Max Weber & de Beaufort, in Maass: „Durch Zentral Sumatra' Bd. II. 1912, Fische, p. 531.

D. 2.7; A. 3.10; P. 1.11; V. 1.6; L. l. 34; L. tr. $\frac{6\frac{1}{2}}{1\ 1\frac{1}{2}-2}$.

Dorsal profile slightly convex. Profile of head straight, abdominal profile convex from snout to anus, with a trenchant keel. Height $3^1/_3$, head $3^3/_4$. Eye $3^1/_2$, nearly $^1/_3$ longer than snout and slightly less than flat interorbital space. Gape of mouth obliquely ascending, reaching to level of lower border of eye. Origin of dorsal opposite to 2nd branched ray of anal, separated by 20 scales from occiput, its distance from occiput somewhat more than that from the point of the caudal. Height of dorsal slightly more than half length of head. Anal emarginate, the greatest height of its anterior somewhat elongated rays equal to half height of body. Ventrals half as long as height of body, separated by one scale from lateral line. Pectorals falcate, pointed, $^1/_3$ longer than head, reaching to posterior third of ventrals. Caudal deeply incised, its lobes pointed, elongated, longer than $^1/_4$ of total length. Lateral line abruptly and nearly vertically bent downward to near ventral profile. Small gular scales reaching only to below pectorals. Brown, back darker, a dark longitudinal band, running from oper-

culum to middle of base of caudal, where it ends in a dark patch. Fins hyaline. A dark median band along the back. Length of single specimen known 42 mm. [Type of the species in the Zoological Museum of Amsterdam].

Habitat: Sumatra (Gunung Sahilan on river Kampar!).

3. Chela Hamilton Buchanan.

(HAMILTON BUCHANAN, Fishes of the Ganges 1822, p. 258. — Swainson, Nat. Hist. of Fishes, Amphib. and Reptiles II. 1839, p. 285).

Oblong or elongate, much compressed. A regularly convex trenchant edge from throat to anus. Dorsal profile more or less straight. Head pointed. Mouth directed upward. Chin prominent. Mandibular symphysis with a prominent hook, fitting into an emargination of the symphysis of the upper jaw. No barbels. Eye large, with a free orbital margin. Dorsal short, without strong spines; totally or with its greater part opposite to anal, which is long and many-rayed. Caudal forked. Ventrals

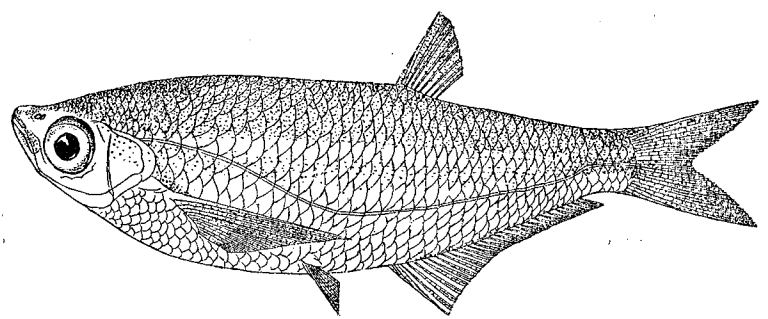

Fig. 22. *Chela oxygastroides* (Blkr.).

inserted somewhat above the abdominal profile, with at least 6 branched rays. Pectorals elongate, situated above the ventral profile. Scales thin, of moderate or small size. Dorsal and nuchal scales smaller than the others, the nuchal ones beginning above the eye. Lateral line without abrupt bend above the pectorals, but gently curved downwards and running in the lower half of the tail. Pseudobranchiae present. Branchial opening reaching below hindmargin of praeoperculum. Gillmembranes broadly united to isthmus. Gillrakers short, cylindrical, widely-set. Pharyngeal teeth slender, hooked, without serrature, in a triple series.

Distribution: Fresh water of indo-australian Archipelago (Sumatra, Java, Borneo), East Indian Continent.

Artificial key to the indo-australian species.

1. Linea lateralis 40—43 . . . . . *Ch. oxygastroides p.* 51.
2. Linea lateralis 50—63.
   a. Pectorals reaching anus or even anal . . . . . *Ch. hypophthalmus* p. 52.
   b. Pectorals reaching to or surpassing ventrals. . . . *Ch. oxygaster* p. 52.

1. Chela oxygastroides (Blkr.) [Fig. 22, p. 50].

Leuciscus oxygastroides Bleeker, Nat. Tijdschr. Ned. Ind. III. 1852, p. 431.
Chela oxygastroides Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 472. — Atl. Ichth. III. 1863, p. 135.
Chela megalolepis Günther, Cat. Brit. Mus. VII. 1868, p. 337.

D. 2.7; A. 3.28—32; P. 2.11—13; V. 2.6; L. l. 40—43; L. tr $\frac{6—7}{1}$ $\frac{}{5—6}$.

Oblong, strongly compressed. Profile of back nearly straight, concave behind the elevated snout. Abdomen convex, with a sharp keel. Height 3.2—3.6, almost 4 to $4^1/_2$ in length with caudal. Head 4.3—4.6, 5.4—5.6 in length with caudal. Eye about 3, equal to snout, and somewhat more than interorbital space. Origin of dorsal opposite to that of anal, much nearer to base of caudal than to head. Height of dorsal $^2/_3$ length of head, about equal to first elongated ray of anal. Ventrals inserted somewhat above the ventral profile, about $^2/_3$ length of head. Pectorals $^1/_3$ longer than length of head, reaching far on ventrals or even to anus. Caudal deeply emarginate, equal to head. Lateral line descending gradually, in a slight curve, the top of which is opposite to ventrals. Gillrakers short, cylindrical, widely set. Pharyngeal teeth 4.3.2—2.4.5. Yellowish brown, with a silvery hue. A silvery longitudinal band along the sides. Fins more or less powdered with black, forming a more or less distinct longitudinal band on each caudal lobe. Length over 200 mm.

Nom. indig.: Seluang, Repang (Djambi), Lalang (Banjermassin), Kĕdukul (river Bŏ), Lundjor pari (Sundan.), Wader pari (Javan.).

Habitat: Sumatra (Palembang, Lahat, Lake Tador!, river Batang Hari!); Java (Batavia, Krawang, Lake Kamodjing near Tjihampeh!, Kediri!, Tulung Agung!); Borneo (river Kapuas: Pontianak, Sintang, Smitau, Putus Sibau!, Sebruang, Knapei;

Danau Sriang, river Sambas, Prabukarta, river Mahakam: Samarinda!, Batu Pangal!, River Bŏ; Upper Riko!). — Siam.

2. Chela hypophthalmus Blkr.

Chela hypophthalmus Bleeker, Ichth. Arch. Ind. Podr. II. Cyprini, 1860, p. 471. — Atl. Ichth. III. 1863, p. 134.
Chela hypophthalmus Günther, Cat. Brit. Mus. VII. 1868, p. 336.

D. 2.7—8; A. 2.30—32; P. 1.11—13; V. 1.6; L. l. 59—63; L. tr. $\frac{12}{1}$.
$\frac{}{6}$

Oblong, strongly compressed. Profile of back slightly convex. Height 3—3.5, 4 or a little more in length with caudal. Head about $4^1/_3$, 5.2—5.4 in length with caudal. Eye more than 3 to 3.4, equal to snout and scarcely more than interorbital space. Origin of dorsal opposite to that of anal, much nearer to base of caudal than to head. Height of dorsal $^2/_3$ length of head, about equal to first elongated ray of anal. Ventrals inserted somewhat above the ventral profile, about $^1/_2$ length of head. Pectorals one third longer than head, reaching anus or even anal. Caudal deeply emarginate, equal to head. Lateral line with a gentle curve, the top of which is about above the anus. Silvery, back darker, with a silvery longitudinal band. Fins hyaline, caudal with a black margin and darkish lobes, the anal may have a black margin. Length 165 mm.

Habitat: Sumatra (Palembang, river Kampar: Gunung Sahilan!; Indragiri); Borneo (Sarawak [British Museum], river Kapuas: Sintang!, Sebruang, Knapei, river Mendalan!).

3. Chela oxygaster (C. V.).

Oxygaster anomalurus van Hasselt, Alg. Konst- en Letterbode 1823, II. p. 133 (no description).
Leuciscus oxygaster Cuvier & Valenciennes, Hist. Nat. Poissons, XVII. 1844, p. 349.
Leuciscus oxygaster Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 453.
Chela anomalurus Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 473. — Atl. Ichth. III. 1863, p. 136.
Chela anomalurus Günther, Cat. Brit. Mus. VII. 1868, p. 335.

D. 2.7; A. 3.27—31; P. 1.13—14; V. 2.7; L. l. 50—60; L. tr. $\frac{11—12}{1}$ (after BLEEKER) $\frac{10}{1}$ (after GÜNTHER) [1]).
$\frac{5—7}{}$ $\frac{}{3}$

1) In the specimens seen by us the scales were damaged.

Elongate, strongly compressed. Profile of back somewhat convex, that of head concave. Height 4 in length without caudal, head 4.5—5, 6—6.5 in length with caudal. Eye 3 or somewhat more, equal to snout and $^1/_3$ or $^2/_5$ longer than interorbital space. Origin of dorsal scarcely in advance of that of anal, about in the middle between head and base of caudal. Height of dorsal $1^1/_2$—2 times in height of body and about equal to first elongated ray of anal. Ventrals inserted above ventral profile, much but not twice shorter than pectorals. Pectorals much longer than head, reaching to ventrals or slightly surpassing them. Caudal deeply emarginate, somewhat longer than head. The lateral line descends in a wide arch to above the ventrals. Silvery, back darkish, with a more or less conspicuous lateral dark band, broadening posteriorly. Fins hyaline; each caudal lobe with a blackish longitudinal band, the upper one continuous with the lateral band. Length 200 mm. [Specimens of VAN HASSELT's collection seen by us in the Leyden Museum].

Habitat: Sumatra (Pangabuang, brooks in province Palembang, Lake Tador!, river Selapian, Upper Langkat, river Wampu, Deli); Java (Batavia, Surakarta, Kediri, Surabaya, Gempol); Borneo (river Pengaron, Kapuas and Baram; Sarawak [British Museum]). — Malacca.

Note. According to Volz (Zool. Jahrb. Abth. Syst. XIX. 1903, p. 405), this fish is much esteemed as food by the Malayans in the province Palembang.

4. **Macrochirichthys** Bleeker.

(BLEEKER, Nat. Tijdschr. Ned. Indië XX, 1859—60, p. 439).

Very elongate, strongly compressed. Back nearly straight.

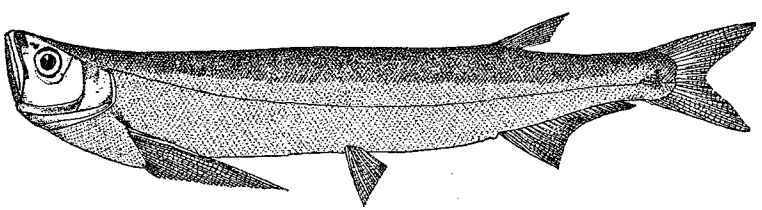

Fig. 23. *Macrochirichthys macrochirus* (C. V.). × $^1/_2$.

A trenchant edge from throat to anus, convex only in its anterior part. Head with the pointed snout directed upwards,

as also the subvertical mouth. Mandibles with the symphysis strongly uncinate, fitting in a deep excavation of the upper jaw, which is roofed by a fold of the skin. No barbels. Suborbital ring narrow. Eye rather large, with a free orbital margin. Dorsal very short, without strong spines, opposite to the anal, which is long and many-rayed. Caudal forked. Ventrals inserted slightly above the abdominal keel, with 7 branched rays. Pectorals elongate, situated in the ventral profile. Scales thin, small, very irregularly arranged, especially those of the upper surface, which reach to above frontborder of eye. Lateral line slightly curved. Pseudobranchiae present. Gillrakers rudimentary. Gillopening ending below eye. Pharyngeal teeth small, uncinate, in two series 5—4.4—4 or 5.

Distribution: Freshwater of indo-australian Archipelago (Sumatra, Java and Borneo); Siam.

1. **Macrochirichthys macrochirus** (C. V.) [Fig. 23, p. 53].

Leuciscus macrochirus Cuvier & Valenciennes, Hist. Nat. Poissons XVII. 1844, p. 348.
Leuciscus uranoscopus Bleeker, Nat. Tijdschr. Ned. Indië I. 1850. p. 14.
Macrochirichthys uranoscopus Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 476. — Atl. Ichth. III. 1863, p. 137.
Macrochirichthys?? *macrochirus* Bleeker, l.s.c. 1860, p. 477. — l.s.c. 1863, p. 137.
Chela macrochir Günther, Cat. Brit. Mus. VII. 1868, p. 338.
Chela macrochir Volz, Revue Suisse Zool. XII. 1904, p. 480.
Macrochirichthys snyderi Fowler, Proc. Acad. Nat. Sci. Philadelphia (2) LVII, 1905, p. 487.

D. 3.7—8; A. 3.22—25; P. 2.15; V. 1.7; L. l. 120—130 (perforated scales).

Height about 6, about 7 in length with caudal. Head 4.5—5, about $5^1/_2$ to more than 6 in length with caudal. Eye 4—5, somewhat shorter than snout, more than interorbital space. Height of dorsal about half length of head, slightly less than that of anterior elongated rays of anal. Ventrals half length of head. Pectorals about $^1/_3$ longer than head, not reaching ventrals. Caudal forked, much shorter than head. Silvery, upper surface greyish, a black blotch at base of caudal. Axil of pectorals blackish. Fins hyaline. Length over 500 mm.

Nomen indig.: Timatima (Palembang), Parang parang (Djambi), Abang (river Bŏ).

Habitat: Sumatra (Palembang, Batang Hari!, Danau Sialong

lotong); Java; Borneo (river Kapuas: Pontianak, Sintang; Danau Sriang, river Kahajan, river Pengaron, Banjermassin, river Mahakam: Batu Pangal!, river Bŏ; river Baram). — Siam.

5. Rasborichthys Bleeker.

(BLEEKER, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 456).

Elongate, or oblong and rather elevated, compressed. A median keel between base of ventrals and anus. Head pointed. Mouth anterior, obliquely ascending, narrow, not extending to below eye. Lips thin, no barbels. Praeorbital triangular, its top directed upwards, suborbitals narrow. Eye large, with broad gelatinous eyelids. Dorsal with 7 branched rays, above the space

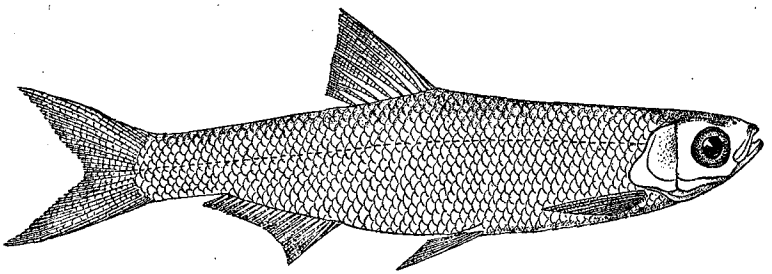

Fig. 24. *Rasborichthys helfrichi* (Blkr.). × 8/9.

between ventrals and anal. Anal many rayed, much longer than dorsal. Scales moderate or small, thin, more or less deciduous. Lateral line curved, running along the middle of the tail. Pseudobranchiae present. Gillrakers long, setiform, closely set. Gill-opening ending below praeoperculum. Gillmembranes united to isthmus. Pharyngeal teeth 1.3.5—5.3.1.

Distribution: Sumatra, Borneo and Singapore.

Key to the species.

1. L. l. 36—38. Lower jaw included. . . . . *R. altior* p. 55.
2. L. l. 55—60. Lower jaw pominent . . . . . *R. helfrichi* p. 56.

1. Rasborichthys altior Reg.

Rasborichthys altior Regan, Ann. Mag. Nat. Hist. (8) XI. 1913, p. 394.

D. 2.7; A. 1.17; P. 1.13; V. 1.6; L. l. 36—38; L. tr. $\frac{8\frac{1}{2}}{1}$.
$\frac{}{7}$

Oblong, rather elevated. Height 2.8—3, 3.5 in length with caudal; head 4.5 in length with caudal. Eye 3—$3^1/_2$, slightly

longer than snout, 1.2 in interorbital space. Lips thin, mouth very oblique, lower jaw included. Origin of dorsal equidistant from eye and base of caudal, opposite to 16th scale of lateral line. Dorsal straight or slightly convex, separated by 24 scales from occiput, its height less than length of head. Anal half as high as dorsal, its origin below the 22nd or 23rd scale of lateral line. Ventrals subequal to pectorals, which are $^3/_4$ or $^4/_5$ length of head and nearly or quite reaching the ventrals. Caudal forked, equal to head. Least height of caudal peduncle more than twice in head, nearly equal to its own length, surrounded by 16 scales, 9 of which are above the lateral lines. Olivaceous above, silvery on sides, with or without dark stripes along the series of scales. Length 60—85 mm. [Type of the species in the British Museum seen by us].

Habitat: Singapore!

2. **Rasborichthys helfrichi** (Blkr.). [Fig. 24, p. 55].

Leuciscus Helfrichii Bleeker, Act. Soc. Scient. Indo Neerl. II. Tiende Bijdrage Ichthyol. Borneo, 1857, p. 15.

Rasborichthys Helfrichi Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 456. — Atl. Ichth. III. 1863. p. 128.

Rasborichthys helfrichii Günther, Cat. Brit. Mus. VII. 1868, p. 319.

Rasborichthys Helfrichii Vaillant, Nouv. Arch. Mus. Hist. Nat. (3) V. 1893, p. 90.

D. 3.7; A. 3.17—19; P. 1.14—15; V. 2.8; L. l. 55—60; L. tr. $\frac{10}{1}$ $\frac{}{9—10}$.

Elongate. Height about $4^1/_2$, nearly equal to head, about $5^1/_2$ in length with caudal. Eye about 3, about equal to interorbital space and somewhat longer than snout. Lips thin, lower jaw prominent. Origin of dorsal somewhat behind middle of line connecting end of snout and end of shortest caudal rays. Dorsal truncate, separated by 28—30 scales from occiput, its last spine equal to head. Anal with the anterior rays the longest, its third spine about half head. Origin of ventrals half length of head before that of dorsal, shorter than pectorals, which are about equal to head without snout. Caudal deeply forked, its lobes pointed, somewhat longer than head. Least height of caudal peduncle about $^1/_3$ less than its height, equal to half length of head, surrounded by about 28 scales, 14 or 15 of which are above the lateral lines. Scales thin and very deciduous. Uniform yellowish in formol specimens. Length about 120 mm.

Nomen indig.: Ikan teri (Djambi).

Habitat: Sumatra (river Batang Hari: Djambi!); Borneo (rivers Kahajan, Kapuas).

6. Parachela Steindachner.

(STEINDACHNER, Sitzber. Akad. Wien LXXXIII. 1881, p. 404).

Body *Chela*-like. Elongate, compressed, with trenchant abdominal edge. Lateral line abruptly descending behind pectorals to beginning of anal region. Scales of unequal size as in *Chela*. Dorsal short, without spines, vertically situated behind beginning of long anal. No ventrals. Gape of mouth directed upwards. No barbels. Lower jaw with a knob-like protuberance at the symphysis. Pharyngeal teeth in three rows, uncinate, not denticulate (4.4.2—2.4.4). Development of shoulder girdle as in subgenus *Oxygaster* of the genus *Chela* [After STEINDACHNER).

Distribution: Borneo, only a single species is known.

1. Parachela breitensteini Steind.

Parachela Breitensteinii Steindachner, Sitzber. Akad. Wien LXXXIII. 1881, p. 404.

D. 9; A. 3.30; P. 12; L. l. circa 60.

Dorsal profile of head slightly concave, strongly ascending immediately behind front, afterwards horizontal to dorsal. Lower profile rapidly descending to below base of pectorals and forming an angle with subsequent abdominal profile, which is nearly straight. Height more than $3^1/_3$, circa $4^1/_3$ in length with caudal. Head circa $4^1/_2$. Eye circa 3, snout circa $3^1/_2$, interorbital space $3^3/_5$ in length of head. Origin of dorsal nearly twice nearer to caudal than to end of snout, vertically situated somewhat behind origin of anal. Anal long. Pectorals strongly developed, their length $2^3/_5$ in length, reaching anal. Caudal bifurcate, the lobes pointed, the lower one more so and longer and stronger than the upper one. Scales unequal, the nuchal ones, which reach to front, and the dorsal ones are small. A silvery longitudinal lateral band. Each caudal lobe with a dark intermarginal longitudinal band. Length 125 mm. [After STEINDACHNER, not seen by us].

Habitat: Borneo (Teweh).

2. Subfam. Rasborinae.

Oblong or elongate, compressed, belly not trenchant, more or less rounded. Dorsal short or of moderate length, with 6—16 branched rays, without an osseous spine, its origin behind that of ventrals. Anal short or elongate, with 5 to 17 branched rays, its origin generally below the end of the dorsal. Pectorals and ventrals always developed. Caudal forked. Mouth terminal, obliquely ascending; lower jaw often projecting, generally provided with a symphysial knob, fitting in an emargination or incision of the upper jaw. A pair of rostral and maxillary barbels or the latter or both are rudimentary or absent. Scales small, moderate or large; lateral line if present abruptely bending downwards; if complete running along lower half of tail. Gillopenings reaching to below praeoperculum or to below eye. Pharyngeal teeth lanceolate or uncinate in a triple or single series.

Artificial key to the indo-australian genera.

I. Barbels absent. Anal with 5 branched rays. Mouth rather small, with a symphysial knob . . . . . *Rasbora* p. 58.

II. Barbels present sometimes rudimentary.

a. Mouth small, without symphysial knob, barbels long. Anal with 5 branched rays . . . . . *Esomus* p. 82.

b. Mouth small, with symphysial knob, barbels long. Anal with 11 or more branched rays. . . . . *Danio* p. 84.

c. Mouth wide, with symphysial knob, barbels short or rudimentary. Anal with 6—8 branched rays. . . . . *Luciosoma* p. 85.

1. Rasbora Bleeker.

(Bleeker, Nat. Tijdschr. Ned. Indië XX. 1859—1860, p. 435).

Oblong or elongate. Mouthopening rather small, ascending. Lower jaw prominent, provided at its symphysis with a knob, fitting in a more or less superficial emargination of the upper jaw. Barbels absent. Dorsal with 7 or 8 branched rays, its origin between that of ventrals and anal. Anal short, with 5 branched rays. Scales large or of moderate size. Lateral line abruptly bending downward and, if complete, running along the lower half of the tail. Gillopenings reaching to below praeoperculum. Gillmembranes connected with the isthmus. Pseudobranchiae present. Pharyngeal teeth 5 to 4, 4 to 2, 1 or 2—1 or 2, 2 to 4, 4 to 5.

Distribution: Indo-australian Archipelago (Sumatra, Nias, Singapore, Riouw, Singkep, Banka, Biliton, Borneo, Java, Bali,

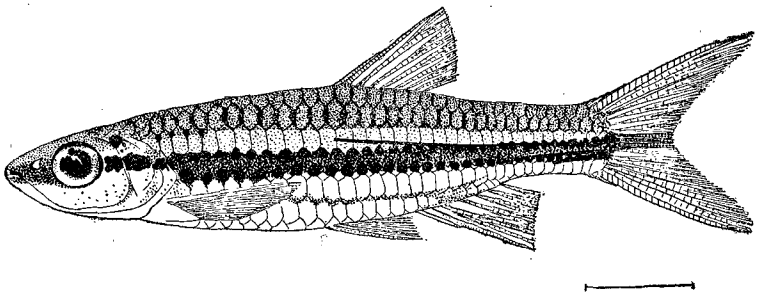

Fig. 25. *Rasbora cephalotaenia* Blkr. × 1½.

Lombok, Sumbawa). Eastern and southern Asia, one species in Africa.

Artificial key to the indo-australian species of Rasbora.

A. Lateral line complete.

I. Nine rows of scales between the lateral lines, counted over the back of the middle of the caudal peduncle.

A. Pectorals shorter than head . . . . . *R. argyrotaenia* p. 61.

B. Pectorals equal to or longer than head . . . . *R. vaillanti* p. 63.

II. Seven rows of scales between the lateral lines, counted over the back of the middle of the caudal peduncle.

A. Origin of dorsal before or in the middle between snout and hindermost caudal scales, above or somewhat behind origin of ventrals.

a. Least height of caudal peduncle more than twice in its length. Caudal lobes or dorsal without dark patch.

1. Head 3.7—4.1 . . . . . *R. tawarensis* p. 63.

2. Head 4.5—4.6 . . . . . *R. leptosoma* p. 65.

b. Least height of caudal peduncle twice in its length, caudal lobes and dorsal without dark patches. Head equal to height, 4—4.4. *R. volzi* p. 66.

c. Least height of caudal peduncle less than twice in its length.

1. Caudal lobes with a black subterminal band. Twelve scales between dorsal and occiput . . . . . *R. trilineata* p. 67.

2. Dorsal deep black in the middle of its anterior part. No bands on caudal. Ten scales between dorsal and occiput. . . . *R. dorsiocellata* p. 68.

B. Origin of dorsal in or behind middle between snout and hindermost caudal scales, always behind origin of ventrals.

1. Dorsal much nearer to anal than to ventrals. *R. rutteni* p. 68.

2. Dorsal in the middle between ventrals and anal or somewhat nearer to ventrals than to anal.

a. Frontborder of anal with a black patch, sides of body uniform. . . . . *R. bankanensis* p. 69.

b. Large dark patches on the sides above pectorals and anal. . . . . *R. kalochroma* p. 70.

c. A black band on sides from snout to caudal.

α. Pectorals longer than or at least equal to head. . . . . *R. einthoveni* p. 72.

β. Pectorals shorter than head.

a'. Origin of dorsal opposite to 12th or 13th scale of lateral line. L. l. 32—33. . . . . *R. cephalotaenia* p. 74.

b'. Origin of dorsal opposite to 10th scale of lateral line. L. l. 25—27. *R. jacobsoni* p. 75.

d. Black band along the sides never continued on head and often reduced to a praecaudal spot or a spot below dorsal. Mostly a spot above base of anal present. *R. lateristriata* p. 76.

α. Band along sides present. L. l. 26—30. *forma typica* p. 76.

β. Band reduced to a praecaudal spot. L. l. less, decreasing to 24. . . . . var. *sumatrana* p. 77.

γ. Band reduced to a spot below dorsal. L. l. 24—29. . . . . var. *elegans* p. 78.

δ. Lateral band rather narrow, a band at the lower surface of the caudal peduncle, bifurcating forwards along the base of the anal. L. l. 29. . . . var. *trifasciata* p. 78.

B. Lateral line incomplete, 7 rows of scales between the lateral lines.

I. Height 6 times in total length. Least height of caudal peduncle more than twice in length of peduncle. L. l. 32—33. Twelve scales round middle of caudal peduncle. . . . . *R. pauciperforata* p. 78.

II. Height 5 times or less in total length. L. l. 26—29.
A. Origin of dorsal opposite to base of ventrals. Nine scales round middle of caudal peduncle. A large, nearly triangular black patch, with its base between dorsal and ventral, and tapering towards the caudal. . . . . *R. heteromorpha* p. 79.
B. Origin of dorsal behind base of ventrals, 10—11 scales round middle of caudal peduncle.
a. Least height of caudal peduncle more than twice in its length. Eye less than $^1/_3$ of length of head . . . . . *R. semilineata* p. 80.
b. Least height of caudal peduncle not more than $1\,^1/_2$ times in its length. Eye more than $^1/_3$ of length of head. . . , ... *R. reticulata* p. 81.

1. Rasbora argyrotaenia (Blkr.).

Leuciscus argyrotaenia Bleeker, Verh. Batav. Gen. XXIII. 1850. Ichth. Midden- & Oost-Java, p. 21.
Leuciscus cyanotaenia Bleeker, Verh. Batav. Gen. XXIII. 1850. Ichth. Midden- & Oost-Java, p. 21.
Leuciscus dusonensis Bleeker, Nat. Tijdschr. Ned. Indië I. 1851, p. 14.
Leuciscus Schwenki Bleeker, Act. Soc. Sc. Indo-Neerl. III. 1858, 6. Bijdrage Vischfauna Sumatra, p. 47.
Opsarius argyrotaenia Bleeker, Nat. Tijdschr. Ned. Indië XVI. 1858—1859, p. 358.
Rasbora dusonensis Bleeker, Ichth. Arch. Ind. Prodrom. II. Cyprini, 1860, p. 445. — Atl. Ichth. III. 1863, p. 122.
Rasbora argyrotaenia Bleeker, Icht. Arch. Ind. Prodrom. II. Cyprini, 1860, p. 448. — Atl. Ichth. III. 1863, p. 123.
Rasbora borneensis Bleeker, Ichth. Arch. Ind. Prodrom. II. Cyprini, 1860, p. 450. — Atl. Ichth. III. 1863, p. 124.
Rasbora argyrotaenia Günther, Cat. Brit. Mus. VII. 1868, p. 195.
Rasbora argyrotaenia Vaillant, Nouv. Arch. du Mus. d'hist. nat. (3) V. 1893, p. 88.
Rasbora everetti Boulenger, Ann. & Mag. Nat. Hist. (6) XV. 1895 p. 187.
Rasbora leptosoma Vaillant, Notes Leyden Museum XXIV. 1902. p. 30 (nec BLEEKER, specimens examined by us).[1]
Rasbora Buchanani Duncker, Fische Malay. Halbinsel. Mitth. Naturh. Mus. Hamburg. XXI. 1904, p. 181.
Rasbora lateristriata Jordan & Seale, Proc. U. S. Nat. Mus. XXXIII. 1908, p. 539.
Rasbora buchanani M. Weber & de Beaufort, Maass: Durch Zentral-Sumatra II. 1912, Fische, p. 529.
Rasbora Buchanani Max Weber, Siboga-Expeditie, Fische 1913, p. 25 [1]).

D. 2.7; A. 3.5; P. 1.12—13; V. 2.7—8; L. l. 29—30.

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1) *R. buchanani* is mentioned also by E. VON MARTENS (Preuss. Exped. Ost-Asien, zoolog. Theil I. 1876, p. 403) from Borneo. This is probably *R. argyrotaenia*, as *R. buchanani* is only known from British India.

Height more than 3—3.6, 4—4.7 in length with caudal. Head 3.8—4.5, 5 to about 6 in length with caudal. Eye 3—3.5, longer than snout, about one fifth shorter than interorbital space. Cleft of mouth ascending, its anterior end about in the level of the upper border of pupil, posteriorly not reaching front-border of eye. Origin of dorsal in the middle between snout and posterior row of caudal scales, opposite to 11th lateral scale, 11—13 scales in front of it. Dorsal slightly convex, situated about in the middle between ventrals and anal, its height less than that of the body. Anal nearly straight, third ray the longest, its height about one third less than that of the dorsal. Ventrals not reaching anal, situated almost in the middle between anal and operculum. Pectorals slightly shorter than head, their end not reaching ventrals, in young specimens somewhat longer. Caudal longer than head, the longest rays twice the shortest rays. Least height of caudal peduncle about $1^1/_2$ its length to the hindermost row of scales. Nine rows of scales between the lateral lines counted over the back of the middle of the caudal peduncle. Colour of alcohol specimens yellowish brown, belly lighter, with a silvery hue, a bluish silvery lateral band, ending before caudal, most conspicuous in the posterior two thirds of the body. Fins hyaline, margin of caudal darkish [1]). Length to nearly 170 mm.

Nom. indig.: Wadĕr padi, Luntjar andong, Luntjar pareh (javan.); Parai (sundan.); Tjettjereh (malay.); Pantao, Seluang (Sumatra).

Habitat: Java (Batavia, Tanah Abang!, Sunter! Bekassi! Perdana, Tjibiliong, Tjiringin, Tjikampeh!, Serang, Tandjong Oost, Tjampea, Buitenzorg!, Tjitjurup, Tjikoppo, Parongkalong, Banjumas, Gombong, Amberawa, Ngawi, Purworedjo, Surakarta, Djokjokarta!, Cave Guwå Gremeng near Gunung Sewu!, Patjitan, Surabaia, Passeruan, Grati, Ngantang, Lesti, Malang, Bondowosso, Tjilatjap); Bali; Sumatra (Palembang!, Lematang ilir, Muara Enim, Lahat, Telok Betong, Padang, Padang Pandjang, Trussan, Priaman, Lake Manindjau!, Lake Singkarah!, Pajakombo, Djambi!, Taluk!, Gunung Sahilan!, Indragiri, Bagan api api!, Deli!); Borneo (Bongon! [Brit. Mus.] Pontianak, Sintang!, Putus Sibau!, Danau Sriang, Sebruang, Knapei, Sambas,

1) We have seen in the British Museum a specimen from Bongon, North Borneo, having a black coloured tip of the upper lobe of the caudal.

Bandjermassin!, Kahajan, Pengarong, Pravukarta, Mendalan River!, Samarinda!, Batu Pangal!, Bunut!, Baram river). — Malay Peninsula!, Siam, Annam!

2. **Rasbora vaillanti** Popta.

Rasbora Vaillantii Popta, Notes Leyden Mus. XXV. 1905, p. 174. — Ibid. XXVII. 1906, p. 151.

D. 2.7; A. 3.5 (6); P. 1.15; V. 2.8; L. l. 27—30; L. tr. $\frac{4\frac{1}{2}}{1}$.
$\frac{}{3\frac{1}{2}}$

Height 4, 5.3 in length with caudal; head 4—4.6, 5.3—5.7 in length with caudal. Eye more than 3.5, slightly shorter than snout and $1^1/_2$ times or slightly more in interorbital space. Origin of dorsal in the middle between snout and posterior row of caudal scales, opposite to 12th scale of lateral line, separated by 11—12 scales from occiput. Dorsal with the upper border oblique, situated nearer to anal than to ventrals; its height about equal to that of the body. Origin of anal opposite to 16th or 17th scale of lateral line. Anal concave, its 3rd ray the longest, which is shorter than the ventrals. Ventrals shorter than pectorals, not reaching anal. Pectorals longer than or equal to head. Caudal much longer than head. Least height of caudal peduncle equal to half length of head. Nine rows of scales between lateral lines, counted over the back of the middle of the caudal peduncle. Preserved specimens brownish above, yellowish below, a dark brown lateral band from head to shortly before caudal, broadening posteriorly; a median dorsal band; a median ventral band on the caudal peduncle, continued on both sides of the base of the anal. Caudal sometimes with a blackish hind border. Length 155 mm. [Type of the species in the Leyden Museum seen by us].

Nom. indig.: Seluwang (river Bŏ).

Habitat: Borneo (river Bŏ!, in British Museum from Kapit river, Sarawak!).

We are not sure that this species ought not to be united with *Rasbora argyrotaenia*.

3. **Rasbora tawarensis** n. sp.

D. 2.6—7; A. 3.5; P. 1.14—15; V. 2.8; L. l. 29—31; Sq. l. 29—31; L. tr. $\frac{4\frac{1}{2}}{1}$.
$\frac{}{2\frac{1}{2}}$

Height 4.1—4.4 times in length, 5.1—5.7 in length with

caudal. Head 3.7—4.1 in length, 4.8—5.1 in length with caudal. Eye 3.3—4, equal to or slightly shorter than snout, and equal to or slightly shorter than flat interorbital space. Cleft of mouth obliquely ascending, its anterior end in the level of the superior border of the eye, its posterior end about one third eye diameter distant from eye. Notch on the border of the upper lip very deep, receiving the strongly developed symphysial knob. Origin of dorsal before or slightly before the middle between snout and last caudal scales, opposite to the 11th lateral scale, separated from head by 11 scales. Dorsal truncate, its height slightly less than that of body, much nearer to ventrals than to anal. Anal concave, its height about one third less than that of the body. Ventrals not reaching anal, one eye-diameter nearer to anal than to operculum, opposite to 10th lateral scale. Pectorals equal to distance from nostril to hindborder of operculum, the distance between their tip and the origin of ventrals equal to eye. Caudal about equal to head, deeply incised, its longest outer rays much more than twice the length of the middle ones. Least height of caudal peduncle more than twice in its length and equal to postorbital part of head. Seven rows of scales between the lateral lines, counted over the back of the middle of the caudal peduncle. Eighteen rather long gill-rakers on the first branchial arch, about equal to one third eye-diameter in length. Colour of formol specimens greyish brown in upper half, yellowish white in lower half, separated by a faint dark lateral band on the body; in its posterior half a black line ending in a black spot at base of caudal, a median dorsal black line. Fins, especially the caudal, with a dark hue. Length 120 mm. [Type of the species in the zoological Museum of Amsterdam].

Habitat. Sumatra (Atchin: Lake Tawar!), collected by Mr. V. D. WERFF. We received this new species through the kind intervention of Lieutenant Colonel Dr. A. J. SALM from Mr. V. D. WERFF, who got them from Laut Tawar, a large lake situated in the interior of Atchin (Gajo-territory). He had the kindness to inform us that the natives assured him that this fish is not known from any other waters. His collection contains 6 specimens of 98—120 mm. which are called by the natives Ikan l'as. He informs us that they are only caught during the north eastern trade-winds, which is the wet season. In the collection are 4 specimens of about 85 mm. which are

called by the natives "Ikan depèq". They are not seen during the north eastern tradewinds, but only during the dry season and even then they appear only in great numbers during the "depèq"-winds, which are blowing with great strength during a few hours. Such depèq-winds, during which the depèq-fishes appear, are blowing in the dry season (April—October), about 4—6 times in each month. Nothing is said about 3 other fishes, 58—66 mm. which carry the name: "Ikan relo", from the same lake, which belong without question to the same species. Our opinion is that these are the representatives of three generations of the same species. It may be that they are living in deeper water and that at least the ikan depèq is forced to come to the surface in consequence of the depèq-winds.

4. **Rasbora leptosoma** (Blkr.).

Leuciscus leptosoma Bleeker, Nat. Tijdschr. Ned. Indië IX. 1855, p. 269.
Rasbora leptosoma Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 446. — Atl. Ichth. III. 1863, p. 123.
Rasbora leptosoma Günther, Cat. Brit. Mus. VII. 1868, p. 196.

D. 2.7; A. 3.5; P. 1.13; V. 2.7; L. l. 31—32; L. tr. $\frac{4\frac{1}{2}}{1}$.
$\quad\quad\quad

Note. We dont think that the specimens from the Baram river, Borneo, which Fowler (Proc. Acad. Nat. Sc. Philad. (2) LVII. 1905, p. 486) called *R. leptosoma*, belong to this species, as he gives 4 for the head and L. l. 27. His description is too short to be able to decide, to which species these specimens belong.

5. **Rasbora volzi** Popta.

Rasbora Volzii Popta, Notes Leyden Museum XXV. 1904—05, p. 175; ibid. XXVII. 1906, p. 157.

D. 2.7; A. 3.5; P. 1.14; V. 2.8; L. l. 29—32; L. tr. $\frac{4\frac{1}{2}}{1}$.
$\frac{}{2\frac{1}{2}}$

Height 4—4.4; 5—7 in length with caudal; head equal to height. Eye 3.4 to more than 4, equal to or shorter than snout, and 1.4—1.8 times in nearly flat interorbital space. Cleft of mouth obliquely ascending, its anterior end in the level of the superior border of the eye, its posterior end not reaching vertical through frontborder of eye. Notch on the border of the upper lip very deep, receiving the strongly developed symphysial knob. Origin of dorsal somewhat before middle between snout and last caudal scales, opposite to 12th lateral scale, separated from head by 11 or 12 scales. Dorsal truncate, its height about equal to height of body, nearer to ventrals than to anal. Anal concave, its height somewhat less than height of body. Ventrals opposite to 10th lateral scale, not reaching anal, their distance from anal somewhat less than their distance from operculum. Pectorals about equal to distance from nostril to hindborder of operculum, the distance between their tip and the origin of the ventrals less than diameter of eye. Caudal somewhat longer than head, deeply incised. Least height of caudal peduncle twice in its own length and more than postorbital part of head; 7 rows of scales between the lateral lines, counted over the back of the middle of the caudal peduncle. Colour brownish, lighter below, scales of back and sides with a dark streak at their base. A median black dorsal line. Fins dark.

A variety with a black longitudinal lateral band from head to tail is described by Miss POPTA (Notes Leyden Museum, XXV. 1904—05, p. 176; ibid. XXVII. 1906, p. 161) as *Rasbora Volzii* var. *fasciata*.

Nom indig.: Seluwang (river Bongan), Seluwang howong (river Howong). — var. *fasciata*: Sĕbĕtĕló (river Kajan).

Habitat: Borneo (rivers Bongan!, Howong! and Kajan!).

Note: This species is very near to *R. tawarensis* M. Web. & de Bfrt. and *R. leptosoma* Blkr. It is characterized by the position of the dorsal fin, the origin of which is farther behind the origin of the ventrals, than in the two above named species, its caudal peduncle is higher and the height of the anal is more.

6. **Rasbora trilineata** Steind.

Rasbora trilineata Steindachner, Sitzungsb. Akad. Wiss. Wien, I. Abth. 1870, p. 637.

? *Rasbora daniconius* Vaillant, Nouv. Arch. Mus. Hist. Nat. (3) V. 1893, p. 88, (partim).

Rasbora calliura Boulenger, Ann. Mag. Nat. Hist. (6) XIII. 1894, p. 240.

Rasbora caudimaculata Volz, Zool. Anz. XXVI. 1903, p. 559. — Zool. Jahrb. Abth. Syst. XIX. 1903, p. 403.

Rasbora trilineata Duncker, Fische Malay. Halbinsel, Mitth. Naturh. Museum Hamburg, XXI. 1904, p. 181.

Rasbora trilineata Max Weber & de Beaufort, in: Maass "Durch Zentral Sumatra", II. 1912, Fische, p. 529.

D. 2.7; A. 3.5; V. 1.7; P. 1.15; L. l. 29—33 (with caudal scales).

Height about equal to head, more than 4, more than 5 in length with caudal. Eye 3.5—3.7; shorter than snout, about $1^1/_2$ in interorbital space. Cleft of mouth ascending, its anterior end in the level of the upper border of the pupil, posteriorly not reaching vertical through frontborder of eye. Origin of dorsal slightly before or in the middle between snout and last row of caudal scales, nearly opposite to or slightly behind origin of ventrals, opposite to 11th lateral scale, 12 scales in front of it. The dorsal is truncate, its height less than that of body. Anal concave, third ray the longest, its height one third shorter than that of dorsal. Ventrals slightly shorter than pectorals, not reaching anal, their origin in fullgrown specimens one eyediameter nearer to anal than to operculum. Pectorals much shorter than head. Least height of caudal peduncle more than $1^1/_2$ in its length to the hindermost row of scales. Seven rows of scales between the lateral lines counted over the back of the middle of the caudal peduncle. The longest rays of the caudal more than twice the length of the shortest ones. Brown above, yellowish below, separated by a bluish silvery lateral band, with brown underneath. A general silvery hue. A dark line

along the middle of the back, and an other along the base of the anal, the two of both sides united into one behind that fin, and running to the lower base of the caudal. Fins hyaline. The caudal lobes with a subterminal black band, and a darkish hue at its base. Length 150 mm.

Habitat: Sumatra (rivers Musi, Kampar!, Lala, Indragiri!, pond near Deli!); Borneo (Senah, Sarawak!, river Kapuas, river Sebuku!).

Note: We unite with the present species the specimens described by BOULENGER as *R. calliura* from Senah, Sarawak, Borneo. We have seen them in the British Museum as also identical specimens from river Sebuku, North East Borneo, belonging to the Museum in Buitenzorg, Java. The only difference is that in *R. trilineata* the black blotches on the lobes of the caudal are subterminal, in *R. calliura* they cover also the tips of the lobes of the caudal. This difference is not a geographical one, as VAILLANT has described specimens from Borneo with subterminal black blotches on the caudal lobes.

7. Rasbora dorsiocellata Duncker.

Rasbora dorsiocellata Duncker, Die Fische der Malay. Halbinsel, Mitth. Naturhist. Mus. Hamburg, XXI. 1904, p. 182.

Differs from the preceding species in having only 10 scales in frout of the dorsal and in wanting the black bands on the caudal. At the other hand the dorsal is deep black in the middle of its anterior part. Measurements, position of fins and colouring are equal for the rest in both species, when specimens of equal length are compared. In the diagnosis of this species DUNCKER says: "Lin. lat. unvollständig". This must be a misprint, as the L. l. in clearly indicated on the figure accompanying DUNCKER's description and as it is very distinct in typical specimens, which Dr. DUNCKER kindly sent us for examination. Length about 45 mm.

Habitat: Sumatra! — Malacca!.

8. Rasbora rutteni n. sp.

D. 2.7; A. 3.5; P. 1.12; V. 2.7; L. l. ca. 26.

Height 3, 3.7—4.1 in length with caudal. Head 3.2—3.3, 4—4.5 in length with caudal. Eye $3^1/_3$—$3^1/_2$, slightly longer than snout, about equal to interorbital space. Cleft of mouth

strongly ascending, its anterior end about in the level of the middle of the eye, posteriorly surpassing frontborder of eye. Origin of dorsal in the middle between snout and posterior row of caudal scales, opposite to 10th lateral scale, 10 scales in front of it. Dorsal rounded, its height about $^4/_5$ of height of body, the end of its base opposite to the beginning of the anal. Anal slightly concave, its height $^2/_3$ of that of the dorsal. Ventrals reaching anal, their base less than one eye-diameter nearer to anal than to operculum. Pectorals not reaching ventrals, equal to head without snout. Caudal somewhat longer than head, the longest rays about twice the shortest. Least height of caudal peduncle about $1^1/_2$ times in its length to the hindermost row

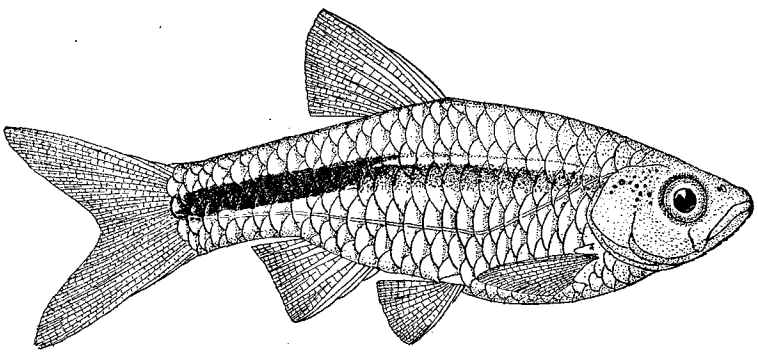

Fig. 26. *Rasbora rutteni* n. sp. × $2^1/_4$.

of scales. Seven rows of scales between the lateral lines, counted over the back in the middle of the caudal peduncle. Colour of formol specimens yellowish grey, belly lighter. A dark band from operculum to base of caudal, the hinderhalf of which is broader and deep black. A median black band on the back. Fins hyaline. In life — according to Dr. RUTTEN — the fins, excepting the pectorals, are rosy, as also the back. Length nearly 50 mm. [Type of the species in the zoological Museum of Amsterdam].

Habitat: Borneo (Sungi Wain!, rivulet near Bontang!). Collected by Dr. L. RUTTEN.

9. **Rasbora bankanensis** (Blkr.).

Leuciscus bankanensis Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 192.
Rasbora bankanensis Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860. p. 454. — Atl. Ichth. III. 1863, p. 127.
Rasbora bankanensis Günther, Cat. Brit. Mus. VII. 1868, p. 197.

D. 2.7; A. 3.5; P. 1.12; V. 1.7; L. l. 24—26 (perforated scales). Height about equal to head, 3.6—4, 4.8—5.3 in length with caudal. Eye 2.7—3, about equal to interorbital breadth; equal to snout, which is rather pointed with a declivous dorsal profile. Cleft of mouth ascending, its anterior end below the level of the middle of the eye, posteriorly reaching below front-margin of eye. Origin of dorsal in the middle between snout and hindermost row of caudal scales, opposite to 10th lateral scale, 10—11 scales in front of it. Dorsal truncate, its height about equal to that of body, about in the middle between ventrals and anal. Anal concave, third ray the longest, its height less than that of the dorsal. Ventrals slightly shorter than pectorals, nearly reaching anal, their origin nearer to anal than to operculum. Pectorals slightly shorter than head. Caudal much longer than head, its longest rays more than twice the length of the shortest. Least height of caudal peduncle about $1^1/_2$ times in its length to the hindermost row of scales. Seven rows of scales between the lateral lines, counted over the back of the middle of the caudal peduncle. Colour of formol specimens brownish, belly lighter. A black lateral line in the hinderhalf of the body, situated in a dark band, which decreases in extensity anteriorly. A median dorsal black line; a dark line above base of anal, which may be continued to the caudal. Fins hyaline, a black distal patch on the anterior part of the anal. A fainter one on the frontborder of the dorsal. Length about 60 mm.

Habitat: Sumatra (Taluk!); Banka. — Malacca!

10. **Rasbora kalochroma** (Blkr.).

Leuciscus kalochroma Bleeker, Nat. Tijdschr. Ned. Indië I. 1850, p. 272.
Rasbora kallochroma Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 443. — Atl. Ichth. III. 1863, p. 121.
Rasbora kallochroma Günther, Cat. Brit. Mus. VII. 1868, p. 195.
Rasbora kallochroma Vaillant, Nouv. Arch. Mus. Hist. Nat. (3) V. 1893, p. 88.
Rasbora kallochroma Perugia, Ann. Mus. Civ. Genova (2) XIII, 1893, p. 244.
Rasbora maculata Duncker, Fische der Malay. Halbinsel, Mitt. Naturhist. Mus. Hamburg, XVI. 1904, p. 182.
Rasbora kallochroma Max Weber & de Beaufort, in Maass: "Durch Zentral-Sumatra", II. 1912, Fische, p. 528.

D. 2.6; A. 3.5; P. 1.13; V. 2.6; L. l. 29—32; Sq. l. 30—31. Height 3.7—3.8, 4.8 in length with caudal. Head 3.8—4,

about 4.8 in length with caudal. Eye more than 3 to $3^1/_2$, longer than snout and nearly $1^1/_2$ in interorbital space. Cleft of mouth, strongly ascending, its anterior end nearly in the level of the upperborder of the eye, posteriorly nearly reaching to vertical through frontborder of eye. Origin of dorsal in the middle between snout and posterior row of caudal scales or very slightly farther behind, opposite to the 11th or 12th of the lateral scales, 11—12 scales in front of it. Dorsal slightly convex, situated in the middle between the ventrals and anal, its height a little less than $^3/_4$ of the height of the body. Anal nearly truncate, third ray the longest, its height equal to $^2/_3$ of height of body. Ventrals not reaching anal, their second ray slightly prolonged, situated one eyediameter nearer

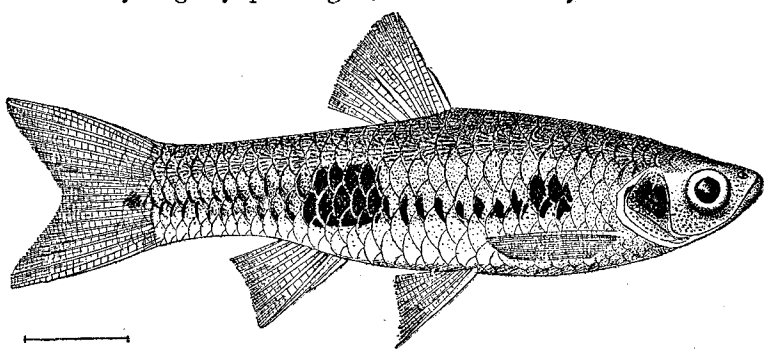

Fig. 27. *Rasbora kalochroma* (Blkr.), about × $1^1/_2$.

to anal than to operculum. Pectorals as long as or a little longer than the head, the first ray prolonged, reaching to ventrals. Caudal equal to head, its longest rays a little less than twice the shortest rays. Least height of caudal peduncle $1^1/_3$ in its length. Seven rows of scales between the lateral lines, counted over the back in the middle of the caudal peduncle. Gill-rakers short, about 11. Colour of formol specimens brownish, back darker, a smaller black spot a few scales behind the gillopenings, a much larger one above the beginning of the anal, both connected by a series of small black spots corresponding to the intermediate scales. Behind the posterior spot, which is roundish or oval, may be a faint dark line continued on the caudal. Fins with a dark hue; the outer margin of the ventrals and of the anal is generally black. Length about 100 mm.

Habitat: Sumatra (Pangherang-Pisang, rivers Kamper kiri!,

Kwantan!, Rokan!); Banka; Borneo (rivers Barito, Kapuas, Sambas, Sadong). — Malacca!.

11. Rasbora einthoveni (Blkr.).

Leuciscus Einthovenii Bleeker, Nat. Tijdschr. Ned. Indië II. 1851, p. 434.
Rasbora Einthovenii Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 440. — Atl. Ichth. III. 1863, p. 120.
Rasbora daniconius Günther, Cat. Brit. Mus. VII. 1868, p. 194 (part.).
Rasbora daniconius Perugia, Ann. Mus. Civ. Genova XXXIII. 1893, p. 244.
Rasbora daniconius Steindachner, Abh. Senckenb. Naturf. Gesellsch. XXV. 1901, p. 454.
Rasbora Einthoveni M. Weber & de Beaufort, in Maass: „Durch Zentral-Sumatra" II. 1912, p. 530.

D. 2.7; A. 3.5 (6); V. 2.7; P. 1.12?—14; L. l. 29—32; L. tr. $\frac{4\frac{1}{2}}{1}$ (between D. and V.).

Height 3.4—3.5, 4.4—4.5 in length with caudal. Head 3.8—4, about 5 in length with caudal. Eye thrice in head, slightly longer than snout, slightly shorter than interorbital space. Cleft of mouth obliquely ascending, its anterior end in the level of the superior part of the eye, its posterior end not reaching vertical through frontborder of eye. Origin of dorsal behind middle of distance between snout and last caudal scales, opposite to 11th or 12th lateral scale, separated by 12 or 13 scales from head. Dorsal slightly rounded, its height about two third of the height of the body, about in the middle between ventrals and anal. Anal concave, its height slightly less than that of the dorsal. Ventrals with the prolonged outer rays nearly reaching the anal, their origin is about one eyediameter nearer to anal than to operculum. Pectorals slightly concave, reaching ventrals, slightly longer than head. Caudal a little longer than head, not very deeply emarginated, its longest rays about one third longer than middle rays. Least height of caudal peduncle 1.4—1.5 in its length, 7 rows of scales between the lateral lines counted over the back of the middle of the caudal peduncle. Colour of formol specimens superiorly dark brown, inferiorly yellowish, both colours separated by a black band from the snout to the end of the caudal, the breadth of which is increasing from the snout to below the dorsal, the hinderpart is broadened ventrally, so that the lateral line is included in it. Outer rays of caudal darkish, as also the anterior and superior part of the dorsal, other fins with a dark hue. Length 85 mm.

Habitat:[1]) Sumatra (Siboga, rivers Kampar Kiri!, Rokan!, Kwantan); Singapore!; Riouw!; Island Singkep!; Banka; Biliton; Borneo (rivers Kahajan, Sambas, Baram, Mangar, rivers near Balik papan! and Bontang!); Bunguran Island [British Museum]. — Malacca, Siam.

GÜNTHER says: (Cat. Brit. Mus. VII. p. 194) "One might be tempted to regard *R. einthovenii* Blkr., as distinct, if the figure given of it be alone consulted. However, it appears from his description that normally the black band is not so much curved as represented; and the specimen sent to the British Museum is absolutely identical with *R. daniconius*". This must be an error. We have at our disposition a good specimen which we received through the kindness of Dr. ANNANDALE from Calcutta under the name of *R. daniconius* and besides some specimens from Ceylon, kindly sent to us by Dr. G. DUNCKER from the Museum in Hamburg. These specimens agree with GÜNTHERS description, they differ from *einthoveni* by having 9 in stead of 7 rows of scales between the lateral lines, counted over the back, by having the pectoral equal to head without snout, whereas the pectoral of *einthoveni* is longer than the head. There are 14—15 scales between the head and the dorsal, in *einthoveni* 12—13. *R. daniconius* has been mentioned by different authors from the Archipelago, but as GÜNTHER has united *einthoveni* with it, it is not sure if those authors have had *einthoveni* or a species which could be identified with *R. daniconius* from India. Only VAILLANT (Nouv. Arch. Mus. (3) V. 1893 p. 86) gives a description of two sets of specimens, which he believed to be *R. daniconius*. One set, containing specimens measuring 33—64 mm. belong probably to *R. trilineata*. About the other set, containing specimens of 163 mm., we are not sure.

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1) The occurrence of this species in lake Galela in Halmahera (STEINDACHNER l. c.) is without question erroneous and a mistake in KÜKENTHAL's collection or in using it. KÜKENTHAL himself says (Forschungsreise in den Molukken and Borneo 1896, p. 152), that he found only one species of fish in this lake, which is, according to STEINDACHNER, *Eleotris macrolepidota* Bloch. On page 126 he pretends to have found "ein paar Cyprinoiden", in the rivers near Oba and Patani, Halmahera. This must be also erroneous as STEINDACHNER found in the collection from this rivers, besides some true marine or brackish water species, only *Kuhlia marginata* (C. V.), which may be taken for a Cyprinoid.

12. Rasbora cephalotaenia (Blkr.). [Fig. 25, page 59].

Leuciscus cephalotaenia Bleeker, Nat. Tijdschr. Ned. Ind. III. (1851) 1852, p. 97.
Rasbora cephalotaenia Bleeker, Icht. Arch. Ind. Prodr. II. Cyprini, 1860, p. 438. — Atl. Ichth. III. 1863, p. 119.
Rasbora cephalotaenia Günther, Cat. Brit. Mus. VII. 1868, p. 193.
Rasbora cephalotaenia Steindachner, Abh. Senckenb. Naturf. Gesellsch. XXV. 1901, p. 454.
Rasbora cephalotaenia Max Weber & de Beaufort, in Maass, "Durch Zentral-Sumatra". II. 1912, Fische p. 530.

D. 2.7; A. 3.5; P. 1.14; V. 1—2.7; L. l. 32—34, Sq. l. 31—32; L. tr. $\frac{4\frac{1}{2}}{1}$ (between D. and V.).

Height 4.1—4.5, in length with caudal 5.2—5.8. Head 3.3—3.8; 4.2—4.8 in length with caudal. Eye 3—3.3, about equal to snout, about one fourth shorter than flat interorbital space. Cleft of mouth obliquely ascending, its anterior end about in the level of the middle of eye, posteriorly touching the vertical through frontborder of eye. Origin of dorsal distinctly behind middle between snout and last caudal scales, above 12th or 13th lateral scale, separated by 12—13 scales from head. Dorsal situated in the middle between ventrals and anal, truncate, its height about $^4/_5$ of that of body. Anal concave, the third ray the longest, shorter than the longest dorsal one. Ventrals nearly reaching anal, situated one fourth to about two thirds of diameter of eye nearer to anal than to operculum, their outer ray slightly prolonged. Pectorals equalling distance between nostril and hindborder of opercle or even shorter; the distance between their tip and the ventrals almost equal to $^1/_2$ diameter of eye. Length of caudal 4.5 in total length, the lobes pointed, the outer rays more than twice the length of the middle rays. Least height of caudal peduncle about $1^1/_2$ times in its length. Seven rows of scales between the lateral lines, counted over the back of the middle of the caudal peduncle. Colour of formol specimens yellowish brown, back darker. A black lateral band beginning at the point of the snout and continued on to the end of the caudal, on the flanks composed of more or less separate dark patches, corresponding to two rows of scales. A narrower band between base of pectorals and middle of anal. An ill-defined superior band composed of narrow black dots on the second superior row of scales. Fins with a dark hue. Length 128 mm.

Habitat: Sumatra (rivers Kwantan!, Kampar kiri!, Lamatang, Musi); Banka; Biliton; Borneo (rivers Kahajan, Baram; Merabah [British Museum].

Note: Karoli (Termeszetrajzi füzetek V. 1882, p. 34) mentions this fish from Ceylon, we believe that he has confounded it with *R. daniconius*.

13. Rasbora jacobsoni n. sp.

Rasbora daniconius Max Weber, Zool. Ergebn. Reise Nied. Ost-Indien, III, Heft 2, 1894, p. 424. (nec. Ham. Buch.).

D. 2.6—7; A. 3.5; P. 1.13; V. 2.8; L. l. 25—27; Sq. l. 26; L. tr. $\frac{4\frac{1}{2}}{1}$ (between D. and V.).

Height 3.7, 4.8 in length with caudal. Head 3.4, 4.4 in length with caudal. Eye 3.7, about equal to snout, somewhat less than the interorbital space. Cleft of mouth strongly ascending, its frontpart strongly undulated, in consequence of the very deep and rather wide notch of the upper lip, which receives the triangularly prominent symphysial part of the mandible. Anterior end of cleft of mouth in the level of the middle of the eye, its posterior end below frontpart of eye. Origin of dorsal conspicuously behind middle of distance between snout and last caudal scales, separated by 11 scales from the head, and opposite the 10th lateral scale. Dorsal rounded, situated much nearer to anal than to ventrals, its height about two third of the height of the body. Anal concave, its height about equal to that of the dorsal. Ventrals not reaching anal, situated in the middle between operculum and anal. Pectorals equal to head without snout. Caudal about 4 in total, deeply emarginate, longest rays about twice the shortest. Least height of caudal peduncle 1.6 in its length. Colour of alcohol specimens brown above, much lighter below, belly yellowish. A band from snout to caudal, anteriorly blackish, getting fainter but broader posteriorly; above it, between head and about the vertical through anal, two longitudinal series of scales silvery, their hindmargin with a dark patch. A dark band along base of anal. Fins greyish. Length 60 mm.

Habitat: West Sumatra (Kaju tanam!, Arau!, Lake Singkarah!, brook near Manindjau!, Fort de Kock!, Pond Ajer tegenang (1150 M. above the sea)!, Siboga!).

The specimens, except those from Siboga, which were collected by Mr. ED. JACOBSON, after whom we have taken the pleasure to name this species, were first described by one of us as *R. daniconius*. Our diagnosis shows that it differs from that of the indian species, which is known, for instance, by the description of GÜNTHER as *R. daniconius*. For differences see under *R. einthoveni*.

14. **Rasbora lateristriata** (Bleeker).

Leuciscus lateristriatus Bleeker, Nat. Tijdschr. Ned. Indië VII. 1854, p. 94.
Rasbora lateristriata Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 441. — Atl. Ichth. III. 1863, p. 121.
Rasbora macrocephalus Bleeker, Atl. Ichth. III. 1863, p. 126.
Rasbora lateristriata Günther, Cat. Brit. Mus. VII. 1868, p. 195.
Rasbora macrocephalus Günther, Cat. Brit. Mus. VII. 1868, p. 197.
Rasbora hosii Boulenger, Ann. and Mag. Nat. Hist. (6) XV. 1895, p. 247.
Rasbora Elberti Popta, Notes Leyden Museum XXXIV. 1911, p. 10.
Rasbora Elberti M. Weber, Siboga Exp. Fische. 1913, p. 25.

D. 2.7; A. 3.5; P. 1.14; V. 1.6—7; L. l. 26—30.

Height 3.7—3.9, 4.6—5 in length with caudal. Head 3.6—4, about 5 in length with caudal. Eye about $3^1/_2$ to almost 4, equal to or somewhat shorter than snout and nearly $1^1/_2$ times in the flat interorbital space. Cleft of mouth strongly ascending, its anterior end about in the level of the upper border of the pupil, posteriorly reaching frontborder of eye or nearly so. Origin of dorsal in the middle between snout and posterior row of caudal scales or farther behind, opposite to 11th lateral scale or one scale less or more. Generally 12 scales in front of it. Dorsal slightly convex, situated about in the middle between ventrals and anal, its height less than that of body. Anal concave, third ray the longest, its height less than that of dorsal. Ventrals generally not reaching anal, situated one eye-diameter, or somewhat less, nearer to anal than to operculum. Pectorals shorter than head, their end far distant from ventrals. Caudal about equal to head, the longest rays a little less than twice the shortest rays. Least height of caudal peduncle $1^1/_2$ to twice in its length to the hindermost row of scales, seven rows of scales between the lateral lines counted over the back in the middle of the caudal peduncle. Gillrakers 12. Colour of upper half brownish, of lower half yellowish, both separated by a black band faintly beginning behind opercle, increasing, also in intensity, below dorsal, its end before caudal

may be broadened; sometimes beginning with a patch below the dorsal. Many specimens with a roundish black patch above the base of anal, in others only faintly indicated or wanting. A black median band on the back from head to caudal. Fins with a dark hue, especially the caudal. Length about 120 mm.

Nom indig. Tjetjerreh (Malay. Batavia), Parai and Gallengang (Sundan.).

Habitat: Java (Bantam [British Museum], Buitenzorg, Tjipanas, Tjisaat!, Pangerango (1000 M.)!, Bandung!, Garut, Purwakarta!, Surabaja!, Blimbing!, Banjumas, Pardana, Tandjong-Oost, Tjampea, Pandjallu, Djember!); Sumatra (Telok Betong, Lahat, Pajakomboh, Manindjau); Borneo (Baram river!); Bunguran Island!, Lombok!, Sumbawa.

Note: We examined specimens of Bleeker's *Rasbora macrocephalus* in the Leyden Museum, and do not see sufficient reason to separate them from *R. lateristriata*. Günther united *R. macrocephalus* with *R. sumatrana*, which we consider to be a variety of *R. lateristriata*.

15. Rasbora lateristriata var. sumatrana (Blkr.).

Leuciscus sumatranus Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 601.
Rasbora sumatrensis Bleeker, Act. Soc. Sc. Indo. Neerl. VIII. 1860. 8ste bijdrage vischfauna Sumatra, p. 54.
Rasbora sumatrana Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 453. — Atl. Ichth. III, 1863, p. 126.
Rasbora sumatrana Günther, Cat. Brit. Mus. VII. 1868, p. 196.
Rasbora sumatrana Vaillant, Nouv. Arch. Mus. Hist. Nat. (3) V. 1893, p. 89 (partim).
Rasbora sumatrana Max Weber, Zool. Ergebn. Niederl. Indien, III, 1894, p. 424.
Rasbora sumatrana Vaillant, Notes Leyden Mus. XXIV. 1902, p. 106.
Rasbora vulgaris Duncker, Fische d. malay. Halbinsel, Mitt. Nat. hist. Mus. Hamburg, XXI. 1904, p. 181.

Distinguished from *R. lateristriata* Blkr. by the number of scales in the lateral line, which are generally less and may decrease to 24, and by the dark lateral band, which is much narrower and sometimes represented only by a bluish black line, ending in an oval or roundish black patch before the caudal [1]). In a series of young specimens from 35 to nearly 50 mm. the young stages show the broad lateral band of

1) This patch is conspicuous in specimens of BLEEKER's collection in the Leyden Museum, although BLEEKER does not mention it in his description; in these specimens the patch above the anal is indicated by a black pigmentation, neither mentioned by BLEEKER.

R. lateristriata Blkr. which disappears in the older stages, leaving only the caudal patch of *R. sumatrana* Blkr.

Habitat: Sumatra (Telok Betong, Benkulen, Lahat, Pati Bubur! and Air Runding! [Padangsche Benedenlanden], Arau!, Kaju Tanam!, Danau di atas (1531 M.)!, Lake Manindjau!, Pajokombo, Sidjundjung!, Serdang!, Sungi Surikaka, Sungi Mahe, Solok, Taluk!, Deli!, Battak Highlands!); Nias!; Borneo (river Kapuas). — Malay Peninsula!.

16. Rasbora lateristriata var. elegans Volz.

Rasbora elegans Volz, Zool. Anzeiger XXVI. 1903, p. 558. — Zool. Jahrb. Abt. Systematik XIX. 1903, p. 402.
Rasbora elegans Duncker, Fische d. malay. Halbinsel, Mitt. Nat. hist. Mus. Hamburg, XXI. 1904, p. 182.

Also this variety differs from *R. lateristriata* Blkr. and equals *R. lateristriata sumatrana* Blkr. in the generally lesser number of scales in the lateral line, which is 24—29. Its coloration is distinguished by a roundish, large black patch below the dorsal and by a smaller one before caudal, both are united by a bluish black line only. In few cases a diffuse pigmentation indicates faintly the black band of *R. lateristriata* Blkr.

Nom. indig.: Seluang (Borneo).

Habitat: Sumatra (Palembang); Borneo (Samarinda!, Kota Baru, Upper Riko!, Bulongan!, Sungi Wain!); Singapore!. — Malacca!.

17. Rasbora lateristriata var. trifasciata Popta.

Rasbora trifasciata Popta, Notes Leyden Mus. XXV. 1905, p. 176. — Ibid. XXVII. 1906, p. 162.

Distinguished, besides by a rather narrow dark lateral band, by a dark band at the lower surface of the caudal peduncle, bifurcating forwards along the base of the anal, increasing in breadth anteriorly and corresponding to the supra-anal patch of the other varieties of *R. lateristriata.*

Habitat: Borneo (River Bŏ!, River Wain!, rivulet near Bontang, river Sadjau near Bulongan!); Sandakan river, North Borneo!.

18. Rasbora pauciperforata n. sp.

D. 2.7; A. 3.5; P. 1.11—12; V. 2.7; Sq. l. 32—33; L. tr. 10, between D. and V. 8.

Height 4.5, 6 in length with caudal. Head about 3.5, about 4.5 in length with caudal. Eye about 3, longer than pointed snout, about equal to interorbital space. Cleft of mouth ascending, its anterior transverse part with only a small elevation at the symphysis of the mandibles and a very shallow emargination of the upper jaw; on the level of the middle of the eye; its hinderend not reaching vertical through frontborder of eye. Origin of the dorsal in the middle between snout and last caudal scales, opposite to 13th lateral scale, 13 scales in front of it. Dorsal truncate, about in the middle between ventrals and anal, its height equal to that of body. Anal concave, its

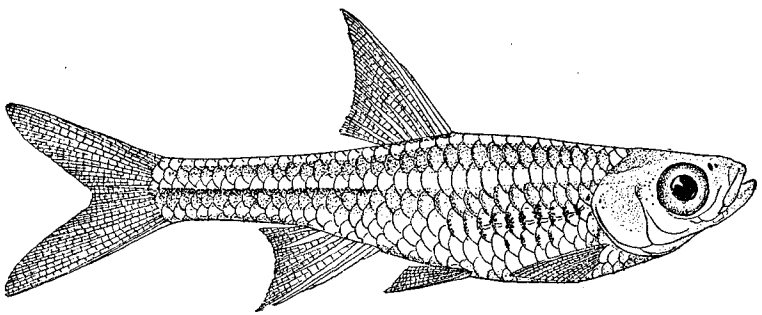

Fig. 28. *Rasbora pauciperforata* n. sp. × 2½.

height less than that of the dorsal. Ventrals reaching anal, their origin one eyediameter nearer to anal than to operculum. Pectorals shorter than head, not reaching ventrals. Caudal longer than head, their pointed lobes about twice the length of the shortest rays. Least height of caudal peduncle more than twice shorter than its length. Twelve scales round middle of caudal peduncle. Lateral line perforating the five first scales, one or two scales farther there may be an other perforated scale. Yellowish, back brown as also a broad lateral band from eye to caudal, separated from the brown of the back by a light band. A median black line along the back and one along the inferior side of the caudal peduncle. Fins hyaline, minutely dotted with black. Length 36 mm. [Type of the species in the zoological Museum of Amsterdam].

Habitat: Sumatra (Gunung Sahilan!, Deli!); collected by Dr. KLEIWEG DE ZWAAN.

19. **Rasbora heteromorpha** Duncker.

Rasbora heteromorpha Duncker, Fische Malay. Halbinsel, Mitt. Naturhist. Mus. Hamburg, XXI. 1904, p. 182.

D. 2.7; A. 3.5; V. 1.7; P. 1.12; Sq. l. 26—27; Sq. tr. $8^1/_2$, to V. $6^1/_2$.

Trunk high, tail slender. Height 2.6, about 3.5 in length with caudal. Head 3.2—3.5, 4.2—4.5 in length with caudal. Eye 2.3, twice the length of the snout, and about equal to interorbital space. Cleft of mouth oblique, its anterior end with a symphysial knob in the mandible and a corresponding emargination of the upper jaw, in the level of the middle of the eye, its posterior end nearly reaching frontborder of eye. Origin of dorsal midway between snout and last row of caudal scales, opposite to origin of ventrals and to 10th—11th lateral scale; 10 scales in front of it. Dorsal rounded, its height equal to head. Anal concave, third ray equal to head without snout. Ventrals reaching anal, their origin in the middle between anal and operculum. Pectorals equal to head without snout. Caudal longer than head, its pointed lobes more than twice as long as shortest rays. Least height of caudal peduncle one fourth less than its length, 9 scales round caudal peduncle. Lateral line formed by 8—9 perforated scales, ending above or before origin of ventrals, separated from it by 2 scales. Nuptial tubercles on head and anterior part of back may be present. Colour of alcohol specimens yellowish brown, back darker. A silvery hue on flanks and belly. A large, nearly triangular black patch with its base between dorsal and ventrals and tapering towards the caudal. A median dark band on back and on lower surface of tail. Fins hyaline, frontborder of dorsal and anal darkish. In living specimens the colour is brownish green with a red hue. Vertical fins vividly red. Length 35 mm. [Specimens of the collection of Dr. G. DUNCKER seen by us].

Habitat: East Sumatra (Deli!). — Malacca!.

20. **Rasbora semilineata** n. sp.

D. 2.7; A. 3.5; P. 1.12; V. 2.7; Sq. l. 28—29.

Height more than 3—3.4, 4.1—4.4 in length with caudal. Head about equal to height. Eye about 2.8 in head, one third longer than snout, about equal to interorbital space. Cleft of mouth ascending, its anterior end transverse, with not more than a symphysial elevation of the mandibles and a corresponding shallow emargination of the upper jaw; in the level of the middle of the eye; posteriorly not reaching frontborder of eye. Origin of dorsal midway between snout and posterior row of

caudal scales, opposite to 10th—11th lateral scale, 11 scales in front of it. Dorsal rounded, situated nearer to anal than to ventrals, its height less than that of the body. Anal slightly concave, its height less than that of the dorsal. Ventrals reaching anal or nearly so, situated in the middle between anal and operculum. Pectorals equal to head without snout. Caudal about as long as head, its rounded lobes twice as long as shortest rays. Least height of caudal peduncle more than twice in its length to last caudal scales, 11 scales round the caudal peduncle. Lateral line consisting of 14—15 perforated scales, descending in a regular curve to opposite the origin of anal, separated by two scales from base of ventrals. Nuptial tubercles on sides of body and tail and on back may be present. Colour of formol specimens uniform yellowish brown, a median black line between head and dorsal and along inferior side of caudal peduncle, continued on each side of the base of the anal. Hindborder of scales on upper side with black points, equal points form an indication of a black lateral band between vertical through pectoral and dorsal. A black line on the hinder half of the body ending in a round precaudal spot. Fin rays more or less darkish. Colour of living specimens: back yellowish, dorsal, caudal and anal with yellow spots. A yellow spot on operculum. Length about 30 mm. [Type of the species in the zoological Museum of Amsterdam].

Habitat: Borneo (Upper course of Sungei Wain!); collected by Dr. L. RUTTEN.

21. **Rasbora reticulata** M. Web. & de Bfrt.

Rasbora reticulatus M. Weber & de Beaufort, Fische aus dem Süsswasser von Nias, in Kleiweg de Zwaan, Die Insel Nias bei Sumatra, 1915, p. 270.

D. 2.7; A. 3.5; P. 1.12—13; V. 1.7; Sq. l. 26.

Height 3.2—3.9; 4.1—5 in length with caudal. Head 3.5, 4.4—4.6 in length with caudal. Eye $3^3/_4$, longer than snout, situated in the anterior half of the head, about equal to the flat interorbital space. Cleft of mouth strongly ascending, its anterior end in the level of the middle of the eye, posteriorly reaching below anterior border of eye. Lips somewhat swollen. Origin of dorsal slightly behind the middle between snout and last row of caudal scales, opposite to 11th lateral scale, 11 scales in front of it. Dorsal about in the middle between

ventrals and anal, truncate; its height slightly less than length of head. Anal feebly concave, its height equal to head without snout. Ventrals don't quite reach anal, one eyediameter nearer to anal than to operculum. Pectorals somewhat shorter than head, when depressed not reaching ventrals. Caudal about equal to head, rather deeply emarginate, its lobes rounded, less than twice the length of the shortest rays. Least height of caudal peduncle not quite $1^1/_2$ times in its length. 10 scales round the middle of the caudal peduncle. Lateral line irregularly and feebly developed, reaching at its most to near the anal,

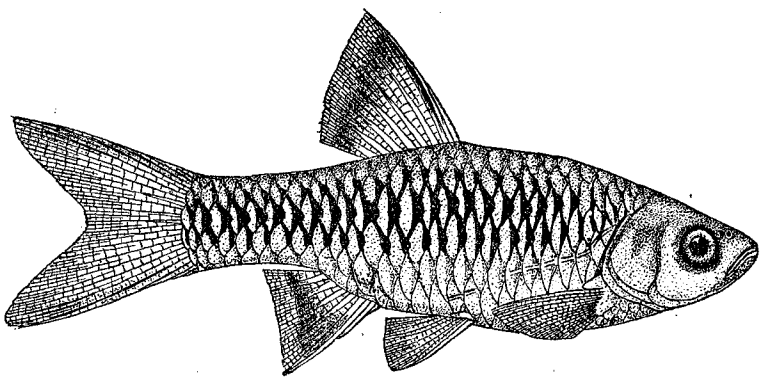

Fig. 29. *Rasbora reticulata* M. Web. & de Bfrt. × 1.8.

but repeatedly interrupted, its anterior part descends with an irregular sinuosity. Colour of formol specimens reddish brown. Median line of back blackish. Three longitudinal series of lateral scales with corresponding series of blackish patches, connected so as to form a reticulate pattern. Many specimens show a blackish patch above the origin of the anal. An elongate black patch behind the operculum. Fins hyaline, dorsal and ventrals with more or less distinct black crossbars in their distal third. Pectorals and anal with a more or less distinct indication of a darkish hue. Upper and lower border of caudal blackish. Length about 60 mm. [Type of the species in the zoological Museum of Amsterdam].

Habitat: Nias!, Sumatra (Batang Hari!).

2. **Esomus** Swainson.

(SWAINSON, Natural History, Fishes II. 1839, p. 285).

Nuria Cuvier & Valenciennes, Hist. Nat. Poissons XVI, 1842, p. 238.

Oblong, strongly compressed. Upper profile nearly straight or from snout to behind nape slightly concave and farther behind slightly convex. Mouthopening small, obliquely directed upwards. Lower jaw without symphysial knob. A pair of rostral and of maxillary barbels. Dorsal short, with 6 branched rays,

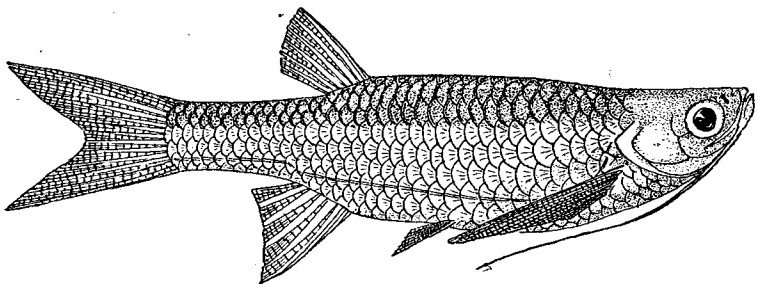

Fig. 30. *Esomus danrica* (Ham. Buch.). × 1.6. (After a specimen from British India).

its origin not much in advance of the anal, which is also short and has 5 branched rays. Scales of moderate size. Lateral line bending down and running along the lower half of the tail. Gillopenings wide, running to below eye. Gillmembranes shortly connected with isthmus. Gillrakers short. Pseudobranchiae present. Pharyngeal teeth lanceolate, in one series 5—5.

Distribution: British India, Nicobars and Ceylon, (Singapore?).

1. Esomus danrica (H.B.).

Cyprinus danrica Hamilton Buchanan, Fishes Ganges 1822, p. 325 & p. 390.
Esomus vittatus Swainson, Nat. History, Fishes 1839, p. 285.
Nuria danrica Günther, Cat. Brit. Mus. VII. 1868, p. 200 (vide syn.).
Nuria danrica Day, Fishes of India 4°. 1878—1888, p. 583.
Nuria Danrica Karoli, Termeszetrajzi füzetek v. 1882, p. 34.

D. 2.6; A. 3.5; P. 1.11—14; V. 1.7; L. l. 30—34; L. tr. $\frac{5\frac{1}{2}}{2\frac{1}{2}}$.

Height somewhat more than the length of the head, 3.7; 4.5—4.8 in length with caudal. Eye more than 3, nearly equal to snout and considerably shorter than the interorbital space. Rostral barbels of different length, always much shorter than maxillary ones, which may reach to end of ventrals. Origin of dorsal midway between frontborder of eye and end of caudal, separated by 18—19 scales from occiput, and opposite to about the 17th scale of lateral line. Ventrals separated by $1\frac{1}{2}$ scales from lateral line, reaching anus. Pectorals much longer than head,

reaching on ventrals. Caudal deeply incised. Least height of caudal peduncle nearly twice in head and more than $1^1/_2$ times in its own length, surrounded by 14 scales, 9 of which above the lateral lines. Silvery, generally a blackish band along the middle of the side. Length 125 mm. [Description made after specimens from British India].

Habitat: Singapore (Karoli). British India, Nicobars and Ceylon. We have included this species as Mr. J. KAROLI mentions it in his list from Singapore, which is remarkable, as it was never found since.

3. **Danio** Hamilton Buchanan.

(HAMILTON BUCHANAN, Fishes of the Ganges 1822, p. 321, 390).

Oblong, head pointed. Mouthopening strongly ascending, rather small. Lower jaw prominent, provided at its symphysis with a knob, fitting in a more or less superficial emargination of the upper jaw. Barbels generally 4 (one rostral pair and one at the corner of the mouth), or 2, rudimental or absent. Praeorbital quadrangular, suborbital very

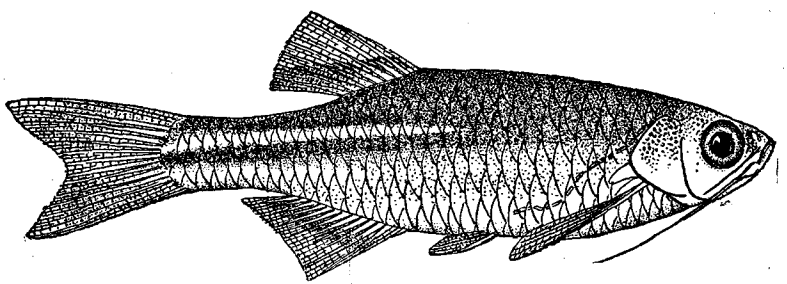

Fig. 31. *Danio albolineata* (Blyth) × 2.6.

broad. Dorsal with 7 to 16 branched rays, originating before anal, its hinder half at least above that fin, which is composed of numerous rays. Ventrals short, far before dorsal. Scales large or of moderate size, forming a sheath along the base of the anal. Lateral line, if present, abruptly bending down, if complete, running along lower half of tail. Pseudobranchiae present. Gillopenings reaching to below eye, gillmembranes connected with isthmus. Pharyngeal teeth 5.3.2—2.3.5, uncinate.

We divide this genus in the two following subgenera:

a. Danio s. str. Dorsal fin elongate, with 12—16 branched rays. Lateral line complete. — Continental Asia, Ceylon.

b. Brachydanio subg. n. Dorsal fin short, with 7 branched rays only. Lateral line incomplete or absent.

1. Danio (Brachydanio) albolineata (Blyth).

Nuria albolineata Blyth, Journ. Asiat. Soc. Bengal, 1860, p. 163.
Danio albolineata Day, Fishes of India 4°. 1878—1888, p. 597.
Danio albolineatus Day, Fauna Brit. India, Fishes I. 1889, p. 358.

D. 2.7; A. 3.13; P. 1.11; V. 1.6; Sq. l. 31—33; L. tr. $8^1/_2$.

Oblong. Height about equal to head, about 3.5, 4.5 in length with caudal. Eye about 3, longer than snout and shorter than interorbital space. Barbel at corner of mouth surpassing base of pectorals, the rostral ones nearly reaching to hindborder of praeoperculum. Origin of dorsal slightly before that of anal, its height one fourth less than length of head and equal to height of anal, separated by 16 scales from occiput. Ventrals somewhat longer than half head, reaching to anus. Pectorals somewhat shorter than or equal to head. Caudal emarginate, as long as head. Lateral line running down in an irregular line and ending shortly before base of ventrals. Least height of caudal peduncle less than half head, surrounded by 10 scales. Ten short, broad, flattened, rather widely-set gillrakers. Colour of formol specimens light reddish, upper surface dark brown, gradually lighter towards belly. A light band (scarlet in living specimens) from the base of caudal running forwards and tapering in a point below origin of dorsal. A median black line on the back. Fins hyaline, a longitudinal darkish band on the dorsal and anal, other fins more or less dusky. Length about 40 mm. (50 mm. according to Day).

Habitat: Sumatra (Pond near Medan, lowland of Deli!, Karo-table land!); collected by Dr. L. PH. DE BUSSY. — Mulmein.

In tanks and streams.

4. Luciosoma Bleeker.

(BLEEKER, Nat. Tijdschr. Ned. Indië, IX. 1855, p. 264).

Elongate, compressed. Dorsal profile nearly straight. Head pointed. Mouth obliquely ascending, its gape wide; lower jaw

somewhat prominent, with a strong symphysial hook, fitting into a groove of the upper jaw. Barbels 4 or 2. Eye with a free orbital margin. Praeorbital pentagon, third suborbital broad, nearly entirely covering the cheek. Short dorsal with 7 branched rays, far back, without strong spines, its posterior rays opposite to anal, which is short and has 6 branched rays. Ventrals originating far before dorsal. Pectorals longer

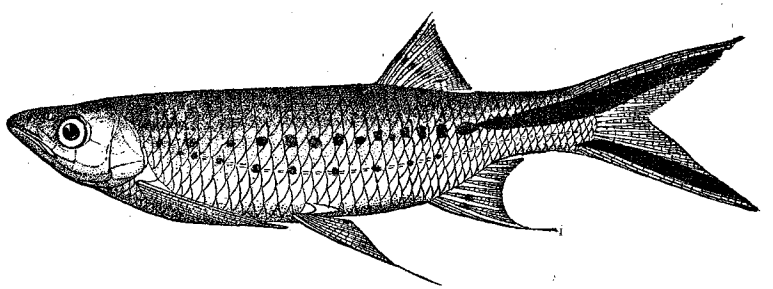

Fig. 32. *Luciosoma trinema* (Blkr.) × 1/2.
a. Symphysial part of lower jaw with knob fitting in a groove of the upper jaw.

than head. Caudal deeply forked. The last dorsal and anal spine and the outer ventral ray may be produced into a long filament. Scales of moderate size, lateral line curved downwards, running along the lower part of body and tail. Pseudobranchiae present. Gillrakers extremely short, widely set. Pharyngeal teeth uncinate in 3 series 5.4.2—2.4.5 or 4.4.2—2.4.4. Branchial opening reaching to below eye.

Distribution: Indo-Australian Archipelago (Sumatra, Java, Borneo). Siam and Indo-China.

Artificial key to the species.

1. Barbels rudimentary . . . . . , *L. trinema* p. 86.
2. Barbels well developed.
   1. A black longitudinal band from snout to upper lobe of caudal. Origin of dorsal above 23rd—24th scale of lateral line . . . . . *L. setigerum* p. 87.
   2. A longitudinal series of black blotches from head continued as a band to end of middle caudal rays. Origin of dorsal above 20th scale of lateral line. . . *L. spilopleura* p. 89.

1. Luciosoma trinema (Blkr.).

Leuciscus trinema Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 600.
Luciosoma (*Trinematichthys*) *trinema* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 416. — Atl. Ichth. III. 1863, p. 132.
Luciosoma trinema Günther, Cat. Brit. Mus. VII. 1868, p. 199.

D. 2.7; A. 3.6; P. 1.14—16; V. 2.8; L. l. 43; L. tr. $\frac{3\frac{1}{2}}{1}$.
$\frac{}{4}$

Height 4—4.3, about 5.4 in length with caudal. Head somewhat less than 4, almost 5 in length with caudal. Eye about $4^1/_2$, about $1^1/_2$ in snout and in interorbital space. End of maxillary reaching to below pupil. A rudimentary barbel on upper jaw near corner of mouth [1]). Dorsal slightly concave, its origin opposite to 20th scale of lateral line, separated by 21 or 22 scales from occiput. An irregular series of small black spots in the anterior $^2/_3$ of the lateral line. A series of broad black spots across the middle of the dorsal and the forepart of the anal. The outer margin of the dorsal may be black. Second spine somewhat produced into a short filament and about equal to head without snout. Origin of anal opposite to 24th or 25th scale of lateral line. Anal concave, its third spine produced into a long filament, which may reach base of caudal. Its height (without filament) equal to that of the dorsal. Ventrals separated by 2 or $2^1/_2$ scales from 13th scale of lateral line. Last undivided ray produced into a long filament, which may reach to end of anal. Pectorals distinctly longer than head, somewhat surpassing base of ventrals. Caudal deeply forked, the lobes pointed. Least height of caudal peduncle about equal to length, surrounded by 15 or 16 scales, 8 or 9 of which above the lateral lines. Yellowish brown, back dark brown. A series of round spots commences about the middle of the side of the trunk, the spots being confluent in a band on the tail, which is continued along the upper caudal lobe, the lower lobe with a similar band. Length about 255 mm.

Nom. indig.: Djadjuo (Palembang).

Habitat: Sumatra (Palembang!, river Kwantan, Upper Langkat, river Batang Hari: Djambi!); Borneo (river Kapuas: Pontianak, Sintang, Sebruang, Danau Sriang, Putus Sibau!, Baram river [British Museum]).

2. **Luciosoma setigerum** (C.V.).

Barbus setigerus Cuvier & Valenciennes, Hist. Nat. Poissons. XVI. 1842, p. 203.
Barbus podonemus Bleeker, Verh. Bat. Gen. XXIII. (1849) 1850, Ichth. Midden-en Oost-Java, p. 18.

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1) According to GÜNTHER l. c.: "Barbels minute, the upper appear sometimes to be absent."

Luciosoma setigerum Bleeker, Nat. Tijdschr. Ned. Indië, IX. 1855, p. 264. — Ichth. Arch. Ind. Prodr. II. Cyprini. 1860, p. 413. — Atl. Ichth. III. 1863, p. 131.
Luciosoma setigerum Günther, Cat. Brit. Mus. VII. 1868, p. 199.
Luciosoma Weberii Popta, Notes Leyden Museum XXV. 1905, p. 177. — Ibid. XXVII. 1906, p. 166.

D. 2.7; A. 3.6; P. 1.14—15; V. 1.8; L. l. 42—44; L. tr. $\frac{5\frac{1}{2}—6}{\frac{1}{4}}$

(counted in greatest height).

Height 4.8—5, 6.2—6.4 in length with caudal. Head about 3.8, 4.8 in length with caudal. Eye 4, about $1^1/_3$ in snout and in interorbital space. End of maxillary reaching to below pupil. Rostral barbels somewhat longer or shorter than the lower ones, which are somewhat shorter than half head. Origin of dorsal above 23rd—24th scale of lateral line, separated by 23 to 25 scales from occiput. Dorsal concave, its height equal to height of body. Anal concave, its height slightly less than that of dorsal, its origin opposite to 26th scale of lateral line. Ventrals with the outer rays produced into long filaments, reaching far on anal, their origin separated by 2—$2^1/_2$ scales from 13th or 14th scale of lateral line. Pectorals about equal to length of head, reaching on ventrals. Caudal deeply forked, the lobes pointed, about equal to head. Least height of caudal peduncle less than half its length, surrounded by 12 scales; before and behind that height they are surrounded by 14 scales. Yellowish brown, back darker. A blackish band along the middle of the side, indistinctly beginning at the snout and continued, increasing in breadth and intensity, into an intramarginal band on the upper caudal lobe. The lower lobe with a similar band. The anterior part of the lateral band may be composed of spots in young specimens. An irregular series of few small black spots in the anterior half of the lateral line. Length more than 265 mm.

Nom. indig.: Wader (Javan.); Djohar (Djambi); Lukui (Bulit).

Habitat: Sumatra (Solok, Sidjungdjung!, Lahat, Batang Hari: Djambi!, Semangus, tributary of river Musi); Java (Batavia, Bekassi, Rankasbetong, Lebak, Kediri!, Surabaya, Gempol); Borneo (river Kapuas, river Bulit, affluent of river Bongan). — Malacca.

We believe that the differences between *L. weberi* and *L. setigerum* (smaller eyes, longer dorsal, pectorals and ventrals) are due to age.

3. Luciosoma spilopleura Blkr.

Luciosoma spilopleura Bleeker, Nat. Tijdschr. Ned. Indië IX. 1855, p. 265. — Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 415. — Atl. Ichth. III. 1863, p. 132.
Luciosoma spilopleura Günther, Cat. Brit. Mus. VII. 1868, p. 199.
Luciosoma Pellegrinii Popta, Notes Leyden Mus. XXV. 1895, p. 178. — Ibid. XXVII. 1906, p. 169.

D. 2.7; A. 3.6—8; P. 1.14—15; V. 2.8; L. l. 41—42; L. tr. $\frac{5\frac{1}{2}}{1} / \frac{}{4\frac{1}{2}—3\frac{1}{2}}$.

Height $4^1/_4$—$4^3/_4$, head $4^1/_2$—5. Eye 4—$4^1/_2$, $1^1/_2$ to almost 2 in interorbital space, more than once to $1^1/_3$ in snout. Maxillary reaching below eye. Rostral barbels 3—8 times diameter of eye, maxillary ones $1^5/_9$—$2^8/_9$. Origin of dorsal above 20th scale of lateral line, separated by 21 scales from occiput. Dorsal somewhat oblique, its height $5^9/_{11}$—7 in length, its 6th, 7th or 8th ray situated above the origin of the anal. Anal concave, its height 6—7 in length, its origin opposite to 22nd—24th scale of lateral line. Ventrals with the inner simple ray produced, $2^3/_8$—$3^2/_3$ in length, their origin separated by $1^1/_2$—2 scales from 12th—13th scale of lateral line. Pectorals reaching on ventrals, $3^3/_8$—$4^1/_8$ in length. Caudal bifurcate, the lobes pointed, the lower lobe much longer than the upper one. In the first third of the caudal peduncle the L. tr. is $\frac{4\frac{1}{2}}{1\frac{1}{2}}$, in the third third : $\frac{3\frac{1}{2}}{2\frac{1}{2}}$. Yellowish below, olive above, on the sides a straight longitudinal series of blackish brown spots. Four to eight small blackish spots in the lateral line. Fins yellow, dorsal and anal with a blackish brown band. The anterior $^2/_3$ of the caudal rays blackish brown, especially so on the four short middle rays. Length 265 mm. [Not seen by us].

Nom. indig.: Dālang Ong (Kajan); Pēnjuar (Malay.).

Habitat: Sumatra (Lahat); Borneo (river Bŏ, Tingar, Baram and Kapit [British Museum]).

Note: *Luciosoma pellegrini* is said to be different from *L. spilopleura* by the produced rays of the ventrals and by the smaller head, which differences between Popta's specimens and the specimen of Bleeker we believe are due to age.

3. Subfam. Cyprininae.

Oval or more or less elongate, head and body compressed

or sometimes depressed, belly not trenchant, rounded or even flattened in which case the pectorals and ventrals are horizontal. Dorsal long or short with 7—30 branched rays, without or with an osseous spine which may be denticulated behind. Origin

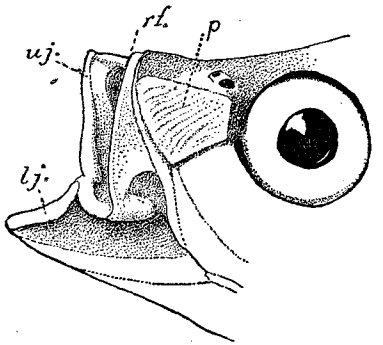

Fig. 33.
Rohteichthys microlepis Blkr. × 1 1/2.

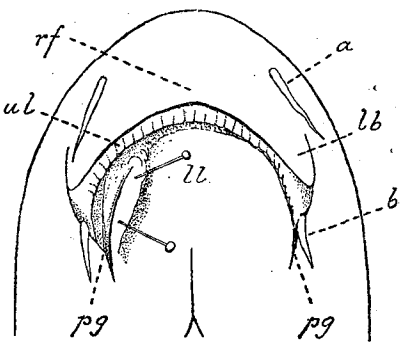

Fig. 34. View of ventral surface of head of *Labeo rohitoides* Blkr.

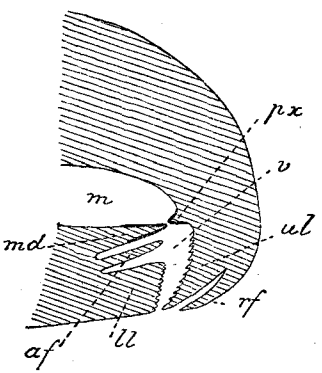

Fig. 35. Scheme of a median section through region of mouth of Labeo.

Lettering for all the figures.

a rostral barbel; *af* transverse fold of lower lip; *b* maxillary barbel; *lb* lateral lobe; *lj* lower jaw; *ll* lower lip; *m* mouth; *md* mandible; *p* preorbital; *pg* post-labial groove; *px* premaxillary; *rf* rostral fold; *uj* upper jaw; *ul* upper lip; *v* vestibulum oris.

of dorsal before, opposite to or exceptionally slightly behind that of ventrals. Anal short, with 5—9 branched rays, without or with an osseous spine, which exceptionally may be serrated. Origin of anal reaches below last rays of dorsal only in the exceptional cases, that the dorsal is very long. Pectorals and ventrals always well developed. Caudal forked or emarginate.

Mouth terminal, inferior or subinferior, generally small, protractile. The jaws with a soft or a horny covering or the lower jaw with a sharp bony edge; without a symphysial knob fitting in an incision of the upper jaw. Lips present or absent, as also a postlabial groove (see below). A rostral and maxillary

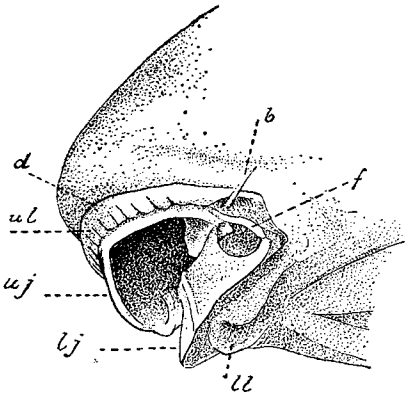

Fig. 36. *Crossochilus gnathopogon* n.sp. × 4.

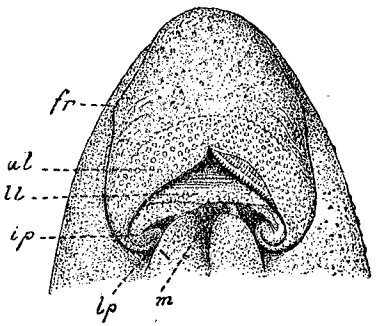

Fig. 37.
Gyrinocheilus pustulosus Vaill. × 3.

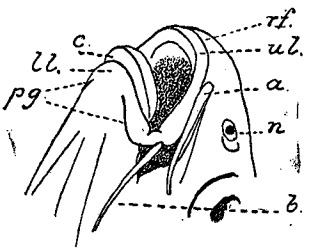

Fig. 38.
Lissochilus sumatranus n. sp.

Lettering for all the figures.

a. rostral, *b* maxillary barbels; *c* horny covering of lower jaw; *d* line of demarcation (not fold) between skin of rostrum and upper lip; *f* frenulum; *fr* lateral furrow including the parts of the mouth; *ip* involuted part of upper and lower lip; *lj* lower jaw; *ll* lower lip; *lp* lateral, *m* median part of postlabial groove; *n* nostril; *pg* postlabial groove; *rf* rostral fold; *uj* upper jaw; *ul* upper lip.

pair of barbels; one or both may be absent. Scales small, moderate or large, lateral line running along the median line of the tail (exc. Leptobarbus). Pharyngeal teeth generally in a triple series, exceptionally in a double or single series.

The formation of the parts of the mouth of this family is very diversified but allows to distinguish three types.

In the most simple one the mouth is anterior or subinferior and more or less protractile; the lips are thin, thick, crenulated or papillated. (By lip we understand a more or less developed fold of the skin, which is more or less distinctly separated from the covering of the jaws). The upper lip is uncovered or only partly covered by a fold containing the maxillaries, forming a simple not pendulous continuation of the skin of the snout directed forwards (fig. 33).

In a second type the mouth is conspicuously inferior, bordered by thick, continuous lips, which may be fringed or papillated. The upper ones are partly covered or bordered by a pendulous rostral fold of the skin of the ventral surface of the rostrum. (fig. 34 and 35).

In the third type there is no rostral fold; the skin of the ventral surface of the rostrum is continued into the upperlip, which is fringed or papillated. Mouth inferior but otherwise very complicated and very differently constructed (fig. 36 and 37).

In many Cyprininae the lower lip is separated from the skin of the isthmus by a complete postlabial groove, which is continued round the corner of the mouth. This groove may be interrupted in the middle, so that there are separate grooves, one behind each lateral part of the lower lip. (fig. 38, cfr. also *Dangila* and *Osteochilus*).

Artificial key to the indo-australian genera of Cyprininae.

I. Lateral line running in the lower half of the tail. *Leptobarbus* p. 95.

II. Lateral line running in the middle of the tail.

A. Dorsal inserted behind ventrals . . . . . *Rohteichthys* p. 99.

B. Origin of dorsal before, opposite to or slightly behind that of ventrals.

AA. A more or less horizontal rostral fold containing at its base the maxillaries and covering the base of the upper lip; mouth anterior or subinferior.

1. Anal spine serrated behind.

a. Four barbels; triple series of molarlike pharyngeal teeth . . . . . *Cyprinus* p. 101.

b. No barbels; single series of compressed pharyngeal teeth . . . . . *Carassius* p. 102.

2. Anal spine not serrated behind.

a. Eye with a broad annular gelatinous eyelid.

α. Mouth inferior . . . . . *Amblyrhynchichthys* p. 104.

β. Mouth terminal. . . . . *Albulichthys* p. 106.

b. Eye without broad annular gelatinous eyelid.

a. Recumbent spine [1]) in front of dorsal; anal with 8—9 branched rays . . . . . *Mystacoleucus* p. 107.

β. No recumbent spine, anal with 8 branched rays . . . . . *Ctenopharyngodon* p. 110.

γ. No recumbent dorsal spine; anal with 5, exceptionally with 7 branched rays.

1) Dorsal with 21—30 branched rays. . . *Dangila* p. 112.

2) Dorsal with 8—18 branched rays.

(*a*). Linea lateralis 56—75.

α. Dorsal with 14—18 branched rays; four or two barbels. . . . *Barynotus* p. 119.

β. Dorsal with 8—10 branched rays; no barbels. . . . . *Thynnichthys* p. 121.

(*b*). Less than 56 scales in lateral line.

aa. Dorsal with 10—18 branched rays . . . . . *Osteochilus* p. 124.

bb. Dorsal with 7—9 branched rays.

1. Both lips thick and fringed. *Cosmochilus* p. 141.

2. Lips entire, exceptionally the upper lip crenulated.

α. Mouth terminal, oblique, wide, reaching beyond front border of eye; 2 maxillary barbels. . . . . *Hampala* p. 143.

β. Mouth terminal or subinferior, not reaching beyond front border of eye; no, 2 or 4 barbels.

αα. Postlabial groove not interrupted in the middle and continuous round corner of mouth.

1. Dorsal spine smooth; no sensory folds on

---

1) Sometimes hidden by scales.

head; $3^1/_2$ scales between L. l. and dorsal. . . . . *Labeobarbus* p. 147.

2. Dorsal spine strongly denticulated; head with sensory folds. $5^1/_2$—7 scales between L. l. and dorsal. . . . . *Cyclocheilichthys* p. 153.

$\beta\beta$. Postlabial groove interrupted in the middle, but continuous round corner of mouth.

1. Lower lip conspicuously separated from jaw, which has a horny covering. Horny tubercles on snout. . . . . *Lissochilus* p. 167.

2. Lower lip not or only by superficial furrow separated from jaw which is without horny covering. Snout without horny tubercles. . . . . *Puntius* p. 170.

$\gamma\gamma$. Postlabial groove modified in the middle into a pouch, as the broadened lower lip is laterally fixed to the skin. . . . . *Balantiocheilus* p. 205.

BB. Skin of ventral surface of rostrum forming a free pendulous rostral fold, covering the base of the upper lip; mouth conspicuously inferior.

1. Suborbital bone covering greatest part of cheek; lower jaw with symphysial tubercle; the broadly reflected lower lip not separated from jaw. . . . . *Barbichthys* p. 207.

2. Ring of suborbital bones not enlarged, lower jaw without symphysial tubercle; lower lip distinct from lower jaw.

a. Dorsal with 10—18 branched rays. . . . . *Labeo* p. 209.

b. Dorsal with 8 branched rays.

α. Snout horizontally divided by a deep groove. *Schismatorhynchus* p. 216.

β. Snout normal . . . . . *Tylognathus* p. 218.

CC. No rostral fold, skin of ventral surface of rostrum continued as upper lip; mouth conspicuously inferior.

1. Lips broadly connected.

a. Upper and lower lip continuous through an involuted lateral part; both lips provided with small rasp-like horny tubercles. No barbels. . . *Gyrinocheilus* p. 224.

b. Upper and lower lip continuous by a lateral part of the lower lip; lips without horny tubercles, but a strong horny tubercle on each side of snout. Four barbels . . . . . *Paracrossochilus* p. 226.

c. Lower lip forming an oval, smooth suctorial disc with a free, papillated anterior and posterior margin. Two or 4 barbels. . . . . *Discognathus* p. 227.

2. Lips not connected or by a frenulum only. Lateral part of upper jaw introverted and embracing lateral part of lower jaw.

a. Snout with a free moveable lateral lobe. A frenulum connecting both lips . . . . . *Epalzeorhynchus* p. 229.

b. Snout without a lateral lobe. A frenulum from upper lip running only to lower jaw . . . . . *Crossochilus* p. 231.

1. Leptobarbus Bleeker.

(Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini. 1860, p. 432).

Oblong, elongate, abdomen rounded. Head broad, depressed.

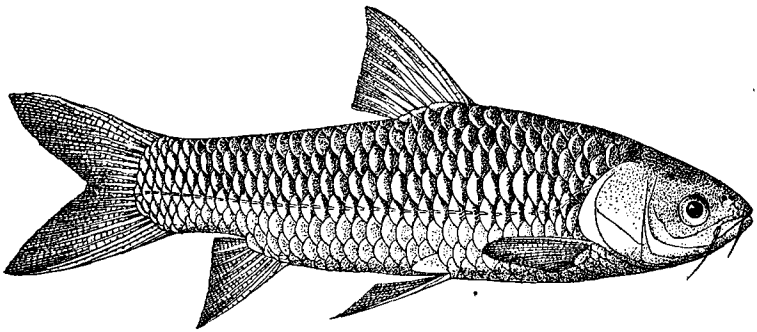

Fig. 39. *Leptobarbus hoeveni* (Blkr.).

Praeorbital about pentagon. Dorsal fin short, with 7 (8) branched rays, its spines weak, without serrations, its origin slightly in advance of that of the ventrals, its base without scaly sheath. Anal very short, with not more than 6 branched rays. Scales of moderate size, nuchal ones beginning before end of operculum. Lateral line curved down-

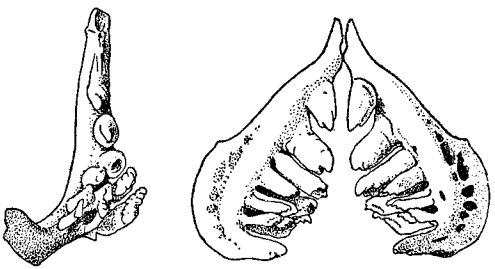

Fig. 40. *Leptobarbus hoeveni* (Blkr.). Pharyngeal teeth. × $1^1/_2$.

wards, running somewhat along lower half of tail. Mouth slightly ascending, of moderate width, extending to frontmargin of eye or nearly so. Jaws equal in front. Barbels 4, well developed, one rostral pair, the maxillary pair at the corner of the mouth. Gillrakers short, lanceolate, widely set. Pseudobranchiae present. Pharyngeal teeth spoonshaped 5.3.2—2.3.5 with the masticatory margin pluricrenulate. Gillopenings extending forwards to below praeoperculum.

Distribution: Sumatra, Borneo and Siam.

Artificial key to the species.

1. $4^1/_2$ scales between lateral line and origin of dorsal. 14 scales round least height of caudal peduncle, 7 of which above lateral lines . . . . . *L. hoeveni* p. 96.
2. $5^1/_2$ scales between lateral line and origin of dorsal.
   a. Least height of caudal peduncle surrounded by 15 scales, 8 of which above lateral lines. No lateral band, fins marked with black . . . . . *L. melanopterus* p. 97.
   b. Least height of caudal peduncle surrounded by 14 scales, 7 of which above lateral lines.
      α. A black lateral band. . . . . *L. melanotaenia* p. 97.
      β. No lateral band . . . . . *L. hosii* p. 98.

1. **Leptobarbus hoeveni** (Blkr.).

Barbus Hoevenii Bleeker, Nat. Tijdschr. Ned. Indië II. 1851, p. 207.
Leptobarbus Hoevenii Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 433. — Atl. Ichth. III. 1863, p. 116.
Leptobarbus hoevenii Günther, Cat. Brit. Mus. VII. 1868, p. 192.
Leptobarbus Hoevenii Vaillant, Nouv. Arch. Mus. Hist. Nat. (3) V. 1893, p. 86.
Leptobarbus hoevenii Volz, Rev. Suisse Zool. XII. 1904, p. 478.

D. 3.7(8); A. 3.5(6); P. 16—17; V. 2.8; L. l. 35—38; L. tr. $\frac{4^1/_2}{3^1/_2}$.

Elongate, dorsal profile regularly ascending from snout to dorsal. Height about 3.5, 4.3 in length with caudal. Head broad, flattened above, 3.8 in length, 4.7 in length with caudal. Eye 4.7, situated in the anterior half of the head, shorter than snout, about $2^1/_2$ in interorbital space. Mouth of moderate width, not extending to frontmargin of eye, with the jaws equal in front. Anterior barbels more than one third of the head, posterior ones about half length of head. Vertical through origin of dorsal nearly half length of head nearer to end of snout than to base of caudal, passing through 9th or 10th

perforated scale. Dorsal concave, the height of its rather weak spine as long as or shorter than head. Anal truncate, its third weak spine about two third length of head. Ventrals almost equal to pectorals, not reaching anus. Their origin, which is about one scale behind that of the dorsal, is separated by $2^1/_2$ scales from the lateral line. Pectorals two third length of head. Caudal deeply emarginate, lobes pointed. Caudal peduncle longer than high, surrounded by 14 scales, 7 of which above the lateral lines. Silvery, upper surface more or less dark brown. A black blotch behind opercle, vertical fins more or less darkish. Length 410 mm.

Nomen indig.: Lemak and Djèladjè (Palembang), Djèlèdjèr (Djambi), Djèlawat (River Mahakam).

Habitat: Sumatra (Palembang!, Indragiri, Kwantan river; Taluk!, Danau Sialong lotong, Djambi!, Bagan api api!); Borneo (river Kapuas: Pontianak, Sintang, Selimbau!; Danau Sriang, Baram river, river Kahajan, Pengaron, Bandjermassin, Mahakam river: Samarinda!, Batu Pangal!, Kota Bungun!). — Siam.

2. **Leptobarbus melanopterus** n. sp.

Differs from the preceding species, when compared with specimens of equal size, by having a much greater breadth of its body, which may account for its having $5^1/_2$ scales above the lateral line in the linea transversalis, and 15 scales round the caudal peduncle, 8 of which are above the lateral lines. The third spine of the dorsal is longer than the head. Upper and lower half of caudal with a broad black intramarginal longitudinal band. A similar one on anal. Ventrals, pectorals and dorsal nearly totally black. Length of single specimen 242 mm. [Type of the species in the zoological Museum of Amsterdam].

Habitat: Borneo (Upper Kapuas: Selimbau!); collected by Mr. H. A. LORENTZ.

Note: We presume that BLEEKER had this species too, as he says from *L. hoeveni*: "Un de mes plus petits individus montre une bande noirâtre longitudinale à chaque lobe de la caudale, mais je n'en vois rien dans tous les autres."

3. **Leptobarbus melanotaenia** Blgr.

Leptobarbus melanotaenia Boulenger, Ann. Mag. Nat. Hist. (6) XIII. 1894, p. 249.
Leptobarbus melanotaenia Popta, Notes Leyden Mus. XXVII. 1905—1906, p. 150.

D. 3.7; A. 3.5; P. 1.14; V. 2.8; L. l. 36—38; L. tr. $\frac{5\frac{1}{2}}{1}$.
$\frac{}{4\frac{1}{2}}$

Elongate, dorsal and ventral profile slightly convex. Height 4, head broad, flattened, $3^1/_2$—4. Eye 5.5 in large specimens, situated in anterior half of head, much shorter than snout, thrice in flat interorbital space, which is nearly half length of head. Mouth with the jaws equal in front, reaching frontborder of eye. Rostral barbels about $1^2/_3$, maxillary barbels about twice as long as diameter of eye. Vertical through origin of dorsal nearly half length of head nearer to end of snout than to base of caudal, passing through 10th perforated scale. Dorsal nearly truncate, the height of its weak spine much shorter than head. Anal nearly truncate, its third weak spine about two third length of head. Ventrals equal to pectorals, far distant from anus. Their origin, which is about one scale behind that of the dorsal, is separated by 2 scales from lateral line. Pectorals two third length of head. Caudal deeply emarginate, lobes pointed. Height of caudal peduncle 1.2 in its length, surrounded by 14 scales, 7 of which above the lateral lines. Silvery, gray above, white below, the two colours separated by a black lateral band running along the lower half of the series of scales above the lateral line and continued on the operculum; posterior border of gillopenings black. Length 500 mm.

Nom. indig.: Béhau (Bŏ).

Habitat: Borneo (river Bongon, river Bŏ, affluent of river Mahakam, river Sedalit, affluent of river Sambabung, North east Borneo!). — Siam [British Museum].

4. **Leptobarbus hosii** (Reg.).

Barbus Hosii C. Tate Regan, Ann. Mag. Nat. Hist. (7) XVIII. 1906, p. 66.

D. 3.7; A. 3.5; P. 1.15; V. 1.8; L. l. 36; L. tr. $\frac{5\frac{1}{2}}{1}$.
$\frac{}{5}$

Height about 4; 5.3 in length with caudal; head 3.3, 4.4 in length with caudal. Eye about 4, shorter than snout, twice in interorbital space. Cleft of mouth extending to below anterior margin of eye. Maxillary barbels somewhat longer than rostral ones, nearly half length of head. Origin of dorsal opposite to 11th scale of lateral line and separated by 11 scales from occiput; equidistant from tip of snout and base of caudal. Third ray of dorsal about two third of length of head. Third ray of anal

slightly shorter than that of dorsal. When laid back the anal reaches the base of the caudal. Pectorals and ventrals subequal and equal to length of head without snout. Pectorals nearly reaching ventrals. Ventrals nearly extending to the anus, their origin two scales behind origin of dorsal and separated by $2^1/_2$ scales from lateral line. Caudal forked, about equal to length of head. Caudal peduncle about as long as high, surrounded by 14 scales, 7 of which above the lateral line. A dark vertical stripe above the root of the pectorals, covered by the opercular flap. Scales dark at the edges, fins pale. Length of the single specimen known 85 mm. [Type of the species in the British Museum seen by us].

Habitat: Borneo (Baram district!).

2. **Rohteichthys** Bleeker.

(Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 395).

Oblong, compressed. Abdomen compressed into a sharp ridge between ventrals and anus, the scales of one side not overlapping on the other. Dorsal fin short, with a strong serrated spine, far behind ventrals, its base in a scaly sheath. Anal very short, with not more than 6 branched rays. Scales

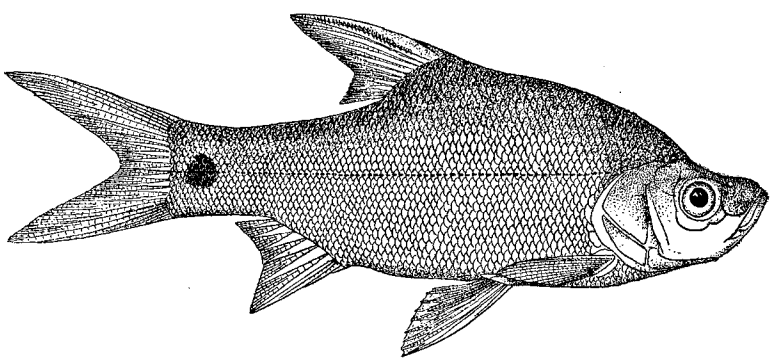

Fig. 41. *Rohteichthys microlepis* (Blkr.) × 1/3.

rather small, nuchal ones beginning far before operculum. Lateral line running along the median line of the tail. Eyes with a free orbital margin. Mouth strongly ascending. Upper lip partly covered by the subtriangular anterior apex of the praeorbital bone. No barbels. Pharyngeal teeth compressed, ending in a spoonlike hook, 5.3.2—2.3.5. Branchial openings ending below eye.

Distribution: The single species only known from Sumatra and Borneo.

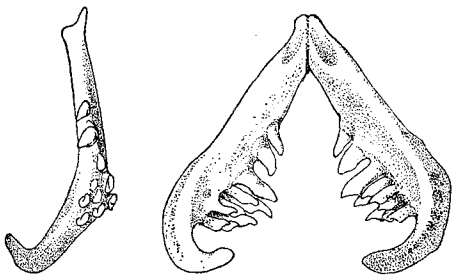

Fig. 42. Pharyngeal teeth of *Rohteichthys microlepis* (Blkr.) × 2.

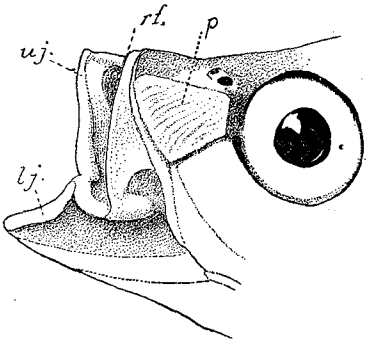

Fig. 43. Head of *Rohteichthys microlepis* (Blkr.) × 1½. *lj* lower jaw; *p* preorbital; *rf* rostral fold; *uj* upper jaw.

1. Rohteichthys microlepis (Blkr.)

Barbus microlepis Bleeker, Nat. Tijdschr. Ned. Indië I. 1850, p. 12.
Systomus microlepis Bleeker, Nat. Tijdschr. Ned. Indië II. 1851, p. 60.
Rohtee microlepis Bleeker, Act. Soc. Sc. Indo-neerl. VIII. 1860, Enum. Spec. pisc. Arch. Ind. p. 53.
Rohteichthys microlepis Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 396. — Atl. Ichth. III. 1863, p. 115.
Rohteichthys microlepis Günther, Cat. Brit. Mus. VII. 1868, p. 191.

D. 3.8; A. 3.5(6); P. 1.16; V. 2.9; L. l. 68—72; L. tr. $\frac{14}{1}$.
$\frac{}{16}$

Profile of back strongly elevated and curved, sharply distinguished from the almost horizontally situated concave profile of the head. Height 2.6—2.7; 3.4—3.6 in length with caudal. Head 3.2—3.4, 4—4.4 in length with caudal. Eye about 4.4, about $1^2/_5$ in snout, which is about equal to interorbital space. Jaws strongly ascending, the lower one prominent. Lips rather thick, partly covered by the praeorbital. Maxillary nearly reaching vertical through frontborder of eye. Origin of dorsal about in the middle of a line connecting frontborder of eye and base of caudal, somewhat more or less than half length of head behind origin of ventrals. Dorsal deeply concave, its base in a scaly sheath. The height of its third spine, the ossified part of which is broad and the hindborder of which is strongly serrated, is shorter than the head. Anal deeply concave, its third spine equal to head without snout. Ventrals

equal to pectorals, about $^4/_5$ length of head, somewhat distant from or reaching anus. Pectorals reaching on ventrals. Caudal deeply forked, about equal to head. Least height of caudal peduncle about twice in head; 31 scales round caudal peduncle, 15 of which above the lateral lines. Scales on back smaller than those on lower side. Silvery, back dark. A black blotch at base of caudal. Upper and lower margin of caudal and margin of dorsal blackish. Length over 300 mm.

Nomen indig.: Ikan Lumu pakkoh and Lumbut (Palembang), Kapas Kapas or Ke Kapas (Djambi).

Habitat: Sumatra (Palembang!, Lahat, Djambi!); Borneo (Banjermassin, river Kapuas, Danau Sriang).

3. **Cyprinus** Cuvier.

(CUVIER, Règne animal II. 1817, p. 191).

Mouth terminal with 4 barbels. Dorsal long, with the last simple ray ossified and serrated behind; its origin opposite to that of ventrals. Anal short, its origin below dorsal, its last simple ray strongly ossified and serrated behind. Scales large,

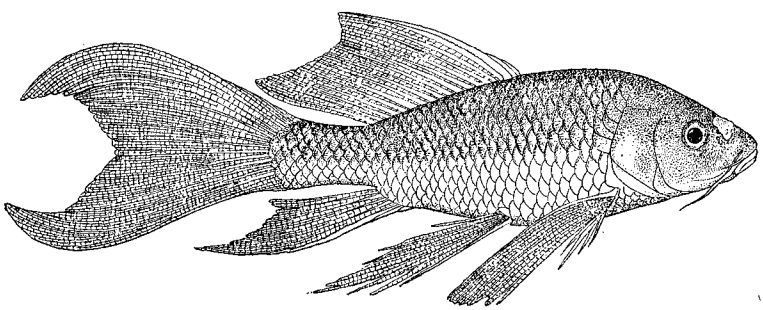

Fig. 44. *Cyprinus carpio* var. *flavipinnis* C.V. $\times$ $^1/_3$.

lateral line complete, running in the middle of the tail. Pharyngeal teeth 3.1.1—1.1.3, molarlike, with the crown sulcate, flat or somewhat hollowed. Branchial openings rather wide, reaching to below hindborder of praeoperculum. Gillmembranes broadly united with isthmus.

Distribution: Fresh water of temperate parts of Asia and Europe, from where introduced in many parts of the world and changed into many varieties.

57296

1. Cyprinus carpio Linné.

Cyprinus carpio Linné, Syst. nat. ed. X. 1753, p. 320.
Cyprinus carpio Günther, Cat. Brit. Mus. VII. 1868, p. 25.

D. 3.17—22; A. 3.5; P. 1.15; V. 1.7—9; L. l. 35—39; L. tr. $\frac{5}{1}$.
$7\frac{1}{2}$

Height of body, length of head, development of fins and squamation subject to variation.

We have seen a specimen from a Chinese fishpond in Kota Radja, Sumatra, which we received under the Chinese name "Ling"; besides we dispose of specimens from Matur, Sumatra.

From Java has been described the variety:

1*a*. Cyprinus carpio var. flavipinnis C.V. [1]).

Cyprinus flavipinnis Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 71.
Cyprinus flavipinna Bleeker, Nat. Tijdschr. Ned. Indië XIII. 1857, p. 345.
Carpio flavipinna Bleeker, Atl. Ichth. III. 1863, p. 74.

D. 4.16—18; A. 3.5; P. 1.13—16; V. 2.8; L. l. 33—37;
L. tr. $\frac{5\frac{1}{2}—6}{7\frac{1}{2}—8}$.

Height 3.5—4.5 in length with caudal, head 3.2—3.6, 3.7—4.9 in length with caudal. Eye 3—5.6, in large specimens more than 1.5 in snout and more than twice in interorbital space. Maxillary barbels may be longer than half length of head. Height of dorsal much more than that of body, that of anal less, but more than that of body. Pectorals and ventrals subequal, much longer than head. Caudal variable in length, it may be nearly equal to double length of head. Least height of caudal peduncle somewhat more than its own length and about twice in length of head. Olivaceous, back darker, sides lighter or they may be silvery or goldish or the whole fish may be golden. Fins always yellowish, reddish or golden.

Nom. indig.: Tambra; when golden Tambra mas or Mas Kumpai (Malay. and Sundan.).

Habitat: In fish ponds in western Java.

4. Carassius Nilsson.

(Nilsson, Prodrom. Ichth. Scandinav. 1832, p. 32).

Mouth terminal, without barbels. Dorsal long, with the last

1) Valenciennes described it as a proper species after a drawing of Kuhl & van Hasselt. Van Hasselt drew attention to this form in a short publication in Alg. Konst- & Letterbode 1823, II. p. 132, where it was, by misprint, called "flopipenna"; he did not give any description of it.

simple ray ossified and serrated behind; its origin opposite to that of ventrals. Anal short, its origin below dorsal, its last simple ray ossified, rather feeble and serrated behind. Scales rather large, lateral line complete, running in the middle

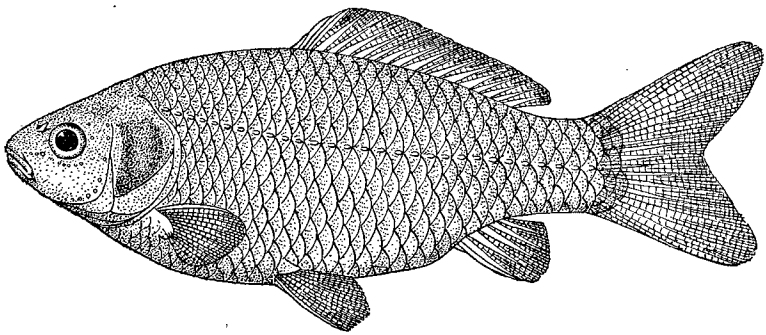

Fig. 45. *Carassius auratus* (L.) × 0.6.

of the tail. Pharyngeal teeth in a single series of four, the three outer (posterior) ones spatulate, with a single furrow. Branchial openings rather wide, reaching to below hindborder of praeoperculum. Gillmembranes broadly united to isthmus.

Distribution: Fresh water of temperate parts of Asia and Europe from where introduced in many parts of the world.

1. Carassius auratus (L.).

Cyprinus auratus Linné, Syst. Nat. ed. X. 1758, p. 322.
Carassius auratus Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 255. — Atl. Ichth. III. 1863, p. 74.
Carassius auratus Günther, Cat. Brit. Mus. VII. 1868, p. 32.

D. 2—3. 17—18; A. 2.5; P. 1. 13—16; V. 2.8; L. l. 25—30; L. tr. $\frac{6}{9\frac{1}{2}}$.

Height about 2.5, head more than 3.3 in length. Eye more than 4, somewhat shorter than snout and nearly twice in slightly convex interorbital space. Dorsal nearly straight, its posterior rays above anal. Pectorals and ventrals subequal. Caudal peduncle about as long as deep and about half length of head. Colour reddish golden.

Nom. indig.: Tambra mas (Malay.).

Habitat: Introduced in ponds in Java.

The wild breed has its home in China and Japan and is in its native conditions dark olivaceous. It is domesticated

and forms many varieties and monstrosities with the dorsal fin reduced to a serrated ray with some soft rays, or the dorsal fin absent. The other fins may be perfect or the anal spine is double, the caudal tri- or four-lobed. Also the eyes may be very large and protruding; the vertebral column can be deflected or otherwise be deformed.

5. Amblyrhynchichthys Bleeker.

(BLEEKER, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 302).

Oblong, compressed, the exceedingly blunt snout obliquely truncate and very high, prominent before the mouth, which is at its lower side. Lower lip very narrow, increasing in size to the corner of the mouth, where it is continuous with the broad hindpart of the upper lip, the anterior part of which is covered by a broad triangular fold, in the middle of the snout, behind which the small maxillaries are situated, which are visible. No barbels. Praeorbital somewhat shoe-shaped, the

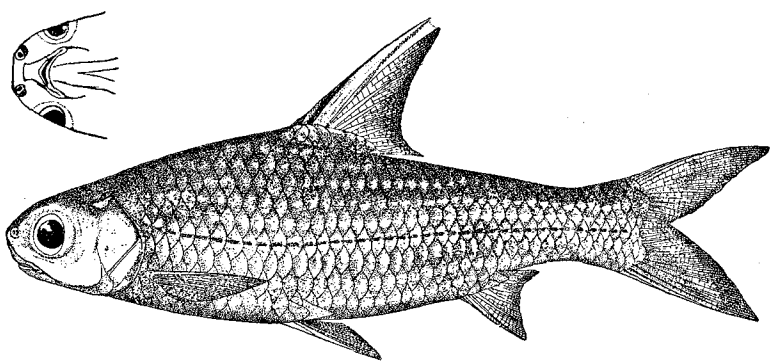

Fig. 46. *Amblyrhynchichthys truncatus* (Blkr.)
and view of lower surface of anterior part of head.

point directed backwards. Nostrils close together, near end of snout, opposite to middle of large eye, which is covered for a large part by an adipose eyelid. Dorsal short, with an exceedingly strong fourth spine, which is denticulated behind, slightly behind origin of ventrals; its base in a scaly sheath. Anal very short, with not more than 6 [1]) branched rays, its spines weak. Scales large, covering only base of caudal; lateral

1) According to VAILLANT, there are 8 soft rays in *A. altus*; according to his drawing this fin is rather long.

line running along the middle of the tail. Pharyngeal teeth 4.3.2—2.3.4, cuneiform, aggregate. Gillmembranes broadly united to the isthmus. Gillopenings reaching to below hindborder of praeoperculum.

Distribution: Fresh water of Sumatra, Borneo; Siam.

Key to the species.

1. $3^1/_2$ (4) scales between lateral line and ventrals.
   L. tr. $\frac{5\frac{1}{2}(6)}{1}$ . . . . . *A. truncatus* p. 105.
   $\frac{}{5\frac{1}{2}}$
2. 5 scales between lateral line and ventrals. L. tr. $\frac{7}{1}$ . . . *A. altus* p. 106.
   $\frac{}{8}$

1. Amblyrhynchichthys truncatus (Bleeker).

Barbus truncatus, Bleeker, Nat. Tijdschr. Ned. Indië I. 1850, p. 13.
Systomus truncatus Bleeker, Nat. Tijdschr. Ned. Indië II, 1851, p. 60.
Amblyrhynchichthys truncatus Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 303. — Atl. Ichth. III. 1863, p. 114.
Amblyrhynchichthys truncatus Günther, Cat. Brit. Mus. VII. 1868, p. 159.

D. 4.8(9); A. 3.5; P. 1.15; V. 2.9; L. l. 35—37; L. tr. $\frac{5\frac{1}{2}(6)}{1}$.
$\frac{}{5\frac{1}{2}}$

Stout, oblong, back strongly ascending from snout, to dorsal. Height 2.8—3, 3.4—3.7 in length with caudal. Head 4.2—4.4, 5.2 in length with caudal, almost as high as long. Eye from more than $2^1/_2$ to nearly 3, about equal to interorbital space and about twice as long as snout, which is very blunt and somewhat prominent before the arched mouth. Vertical through origin of dorsal running through about the 11th scale of lateral line, and nearer to end of snout than to caudal and one scale behind origin of ventrals. Dorsal concave, its fourth ray strongly ossified, exceedingly strong and evenly serrated behind, much longer than head. Base of dorsal in a scaly sheath. Anal concave, its third spine weak, somewhat more than half head. Ventrals about equal to pectorals, separated by $3^1/_2$ (4) scales from the lateral line, far distant from anus. Pectorals about $^4/_5$ of head. Caudal deeply emarginate, the lobes rounded, shorter than head. Least height of caudal peduncle $^3/_5$ of its length, equal to half head or somewhat more. 16 scales round caudal peduncle, 7 of which above the lateral lines. Scales with converging longitudinal sinuous lines. Colour of alcohol specimens silvery, back dark, with longitudinal shining lines corresponding to

the rows of scales. Fins, especially the vertical ones, with dark margins. Length 280 mm.

Nomen indig.: Teban galang, Bettet (Palembang); Semumul (Djambi).

Habitat: Sumatra (Palembang, Djambi!); Borneo (river Kapuas: Pontianak, Bunut!, river Barito: Banjermassin). — Siam.

2. **Amblyrhynchichthys altus** Vaill.

Amblyrhynchichthys altus Vaillant, Bull. Soc. Zool. de France, XVIII. 1893, p. 59. — Nouv. Arch. Mus. (4) V. 1893, p. 81.

D. 3.8; A. 3.8; V. 1.9; L. l. 36; L. tr. $\frac{7}{1}$.
$\frac{}{8}$

Elevated, compressed. Height $2^1/_3$, nearly 3 in length with caudal. Head 3.7, 4.5 in length with caudal. Eye 2.6, equal to interorbital space, $^1/_4$ longer than snout. Dorsal spine denticulated behind, probably equal to half height of body. Ventrals separated by 5 scales from lateral line. Length of single specimen 96 mm. (After VAILLANT, not seen by us).

Habitat: Borneo (river Kapuas).

6. **Albulichthys** Bleeker.

(BLEEKER, Nat. Tijdschr. Ned. Indië XX. 1859—1860, p. 430).

Oblong, strongly compressed. Mouth terminal, lateral, snout convex. Lips thin, continuous, the upper one partly covered by a rostral fold, which contains the maxillaries. Postlabial

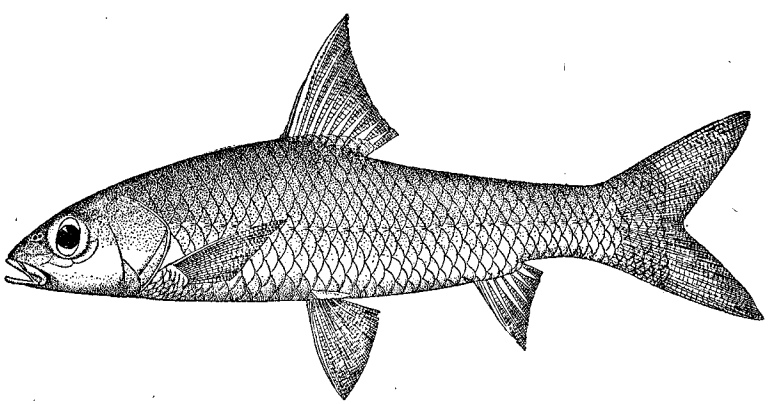

Fig. 47. *Albulichthys albuloides* (Blkr.). (After Bleeker) $\times ^2/_5$.

groove not continuous, laterally only developed. No barbels. Eyes with a broad annular adipose eyelid. Dorsal short, with

8 branched rays and the 4th simple ray ossified, slender, finely serrated. Origin of dorsal slightly before that of ventrals. Anal very short, with 5 branched rays, its spine weak. Caudal deeply forked, its basal half covered with small scales. Scales of moderate size. Lateral line running in the middle of the tail. Pharyngeal teeth compressed, their masticatory surface longitudinally grooved, 4.3.2—2.3.4. Gillopenings rather narrow, reaching to hindborder of praeoperculum.

Distribution: The single species only known from fresh water of Sumatra and Borneo.

1. Albulichthys albuloides (Blkr.).

Systomus albuloides Bleeker, Nat. Tijdschr. Ned. Indië IX. 1855, p. 425.
Albulichthys albuloides Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 306. — Atl. Ichth. III. 1863, p. 114.
Albulichthys albuloides Günther, Cat. Brit. Mus. VII. 1868, p. 160.

D. 4.8; A. 3.5; P. 1.16—18; V. 1.9; L. l. 38; L. tr. $\frac{5\frac{1}{2}}{1}$.
$\frac{}{5\frac{1}{2}}$

Height 3—4, nearly equal to the length of the head. Eye about $3^1/_2$, a little longer than snout. Origin of dorsal opposite to 9th or 10th scale of lateral line, separated by 11—12 scales from occiput. Origin of anal opposite to 23rd scale of lateral line. Pectorals and ventrals subequal; origin of ventrals separated by $3^1/_2$ scales from 10th—11th scale of lateral line. Pectorals more than one and a half times in length of head. Least height of caudal peduncle 1.4 in its own length, surrounded by 16 scales. Silvery, back darkish. Length 360 mm. [One of BLEEKER's specimens in the Leiden Museum examined by us].

Habitat: Sumatra (Palembang); Borneo (river Kapuas and Kahajan).

7. Mystacoleucus Günther.

(GÜNTHER, Cat. Brit. Mus. VII. 1868, p. 206).

Oblong, compressed, abdomen rounded. Dorsal fin short, about opposite to origin of ventrals, with 8—9 branched rays and an osseous spine, serrated behind and of moderate strength. Anal of moderate length, with 8—9 branched rays. Scales of moderate size, the nuchal ones beginning somewhat before the vertical through the hindborder of the operculum. Lateral line running along about the middle of the tail. Mouth small, somewhat inferior, with the margin of the lower jaw obtuse,

surrounded by rather thin continuous lips. Barbels small, especially the rostral ones, which may be wanting. A recumbent spine in front of the dorsal, pointing forwards, sometimes

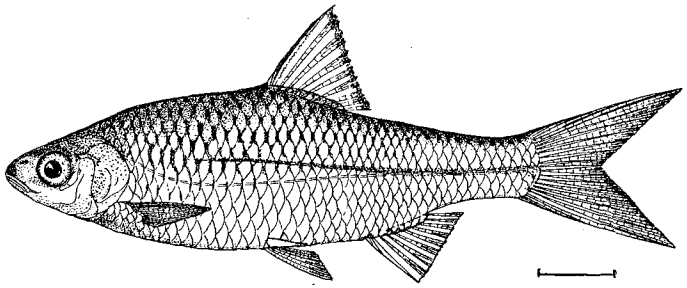

Fig. 48. *Mystacoleucus padangensis* (Blkr.) × 1/1.

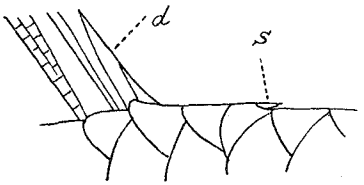

Fig. 49. *Mystacoleucus marginatus* (C.V.) Portion of back carrying anterior part of dorsal fin *d*, to show the procumbent spine *s* in front of dorsal. Enlarged.

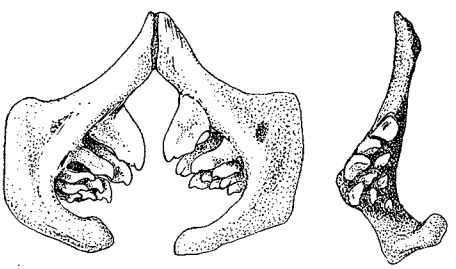

Fig. 50. Pharyngeal teeth of *Mystacoleucus marginatus* (C.V.) × 4.

hidden by the scales. Gillopenings extend to below angle of praeoperculum. Gillmembranes united with isthmus. Gillrakers short, conical. Pharyngeal teeth obtuse, uncinate, 4.3.2—2.3.4.

Distribution: Fresh water of Sumatra, Java, Borneo and Malacca.

Key to the species.

1. L. l. 26—29. Barbels 4 . . . . . *M. marginatus* p. 108.
2. L. l. 37—39. Barbels 2 or wanting. . . . . *M. padangensis* p. 110.

1. Mystacoleucus marginatus (C.V.).

Barbus obtusirostris van Hasselt, Algem. Konst- en Letterbode II. 1823, p. 132. (no description).

Barbus marginatus Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 164.

Barbus obtusirostris Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 167.

Barbus marginatus Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 518.

Systomus (Barbodes) marginatus Bleeker, Icht. Arch. Ind. Prodr. II. Cyprini, 1860, p. 351.

Puntius (Barbodes) obtusirostris Bleeker, Atl. Ichth. III. 1863, p. 106.
Barbus obtusirostris Günther, Cat. Brit. Mus. VII. 1868, p. 121.
Barbodes obtusirostris Jordan & Seale, Proc. U. S. Nat. Mus. XXXIII. 1908, p. 538.

D. 4.8; A. 3.8—9 (10); P. 1. 14—15; V. 1.8; L. l. 26—29; L. tr. $\frac{5}{1}$.
$\frac{}{4\frac{1}{2}}$

Compressed, oblong, dorsal profile ascending and slightly convex. Height 2.7—3, 3.7—4 in length with caudal. Head 4.1—4.2, 5.6—5.7 in length with caudal. Eye about $2^1/_2$—3, equal to convex interorbital space, but longer than snout, which is very blunt and slightly prominent. Snout and upper part of head provided with pores, diminishing in size backwards. Posterior barbels at corner of mouth shorter than eye, but much longer than the very slender rostral ones. Origin of dorsal opposite to 9th or 10th scale of lateral line, somewhat before the middle of a line connecting end of snout and root of caudal and opposite to origin of ventrals or slightly behind it, separated by 9—10 scales from occiput. Dorsal slightly emarginate, fourth spine with its flexible portion not much longer than head, rather strong, strongly serrated behind. Anal truncate, its height about equal to head without snout or somewhat shorter, both dorsal and anal with a scaly sheath at their base. Ventrals subequal to pectorals, their hindborder square, not reaching anal, separated by 3 scales from lateral line. Axillary scale of ventrals much developed. Pectorals nearly equal to head. Caudal deeply forked, the lobes pointed, much longer than head. Least height of caudal peduncle about $1^3/_4$ in head, about 1.4 in length of caudal peduncle, surrounded by 14 scales. 10 short triangular gillrakers on first branchial arch. Silvery, upper surface brownish, base of scales with a semilunar dark transverse band. Margin of dorsal and caudal blackish. Length 200 mm.

Nomen indig.: Lawak, Lalawak (Malay. Batavia), Wadĕr etjo (Javan.), Genggèhèk (Sundan.), Kapyah (Lampong).

Habitat: Sumatra (Pangabuang, Pajakombo, Trussan, Priaman, Lahat, Indragiri, river Selapian, Upper Langkat, Djambi!, Deli!); Java (Batavia, Lebak, Rankas betong, Sadjira, Tjikaniki, Tjampea, Buitenzorg!, Tjandjur, Tjipanas, Garut!, Lelles, Parongkalong, Lake Wanajasa near Purwakarta!, river Guwå in Djocja!, Surakarta, Ngawi, Pasuruan, Grati, Ngantang, Lesti, river Mandiku in Djember!); Borneo (Sarawak). — Malacca.

2. **Mystacoleucus padangensis** (Blkr.) [Fig. 48, p. 108].

Capoeta padangensis Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 593.
Systomus (Capoëta) padangensis Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 353.
Puntius (Capoëta) padangensis Bleeker, Atl. Ichth. III. 1863, p. 107.
Mystacoleucus padangensis Günther, Cat. Brit. Mus. VII. 1868, p. 206.
Mystacoleucus (Puntius) padangensis Max Weber, Zool. Ergebn. Heft 2, 1894, p. 423.
Mystacoleucus padangensis Max Weber & de Beaufort, In Maass: Durch Zentral-Sumatra II. 1912, Fische p. 531.

D. 4.8 (9); A. 3.8; P. 1. 14—15; V. 2.9; L. l. 37—39; L. tr. $\frac{7}{1}$.
$\frac{}{5}$

Oblong, profile from snout to dorsal slightly arched. Height about $3^1/_2$, about $4^1/_2$ in length with caudal. Head 4.5, more than 5 in length with caudal. Eye nearly 3, equal to interorbital space and slightly longer than rounded and somewhat prominent snout. Mouth normal. A small barbel at corner of mouth, which may be wanting on one or both sides. Origin of dorsal opposite to middle of line connecting end of snout and base of caudal and to 12th or 13th scale of lateral line as well as to origin of ventrals. Dorsal slightly concave, separated by 12 scales from occiput; its strong, and strongly denticulated fourth spine shorter than head. Anal nearly truncate, its weak spine about half length of head. Ventrals about equal to pectorals, not reaching anus, separated by 3 scales from lateral line. Pectorals shorter than dorsal spine. Caudal deeply emarginate, lobes pointed. Least height of caudal peduncle about twice in head. 18 scales round caudal peduncle, 9 of which above the lateral lines. Scales with concentric lines. Lateral line with a curve downwards, running along middle of tail. Colour silvery. Fins hyaline, more or less dusky, anterior border of dorsal and hindmargin of caudal blackish. Length 116 mm.

Nomen indig.: Bako (Malay. Sumatra).

Habitat: Sumatra (Padang, Solok!, Lake Singkarah!, Lake Manindjau!, river Kwantan, Taluk!).

8. **Ctenopharyngodon** Steindachner.

(STEINDACHNER, Ichth. Mitth. IX. in Verhandl. zool. bot. Ges. Wien XVI. 1866, p. 782).

Elongate, head broad, anteriorly depressed. Dorsal fin short, with 7 branched rays, its spines weak, without serration, its origin slightly in advance of that of the ventrals, its base

without scaly sheath. Anal short, with 8 branched rays and weak spines. Scales of moderate size, their uncovered part transversely rugose between the radiating lines. Lateral line complete, running nearly in the middle of the tail. Mouth anterior, its gape rather wide, not reaching frontborder of eye. Upper jaw somewhat prominent. Lips moderately developed, a horizontal rostral fold, containing at its base the maxillaries, covering the base of the upper lip. Postlabial groove only near corner of mouth and continued round it. No barbels.

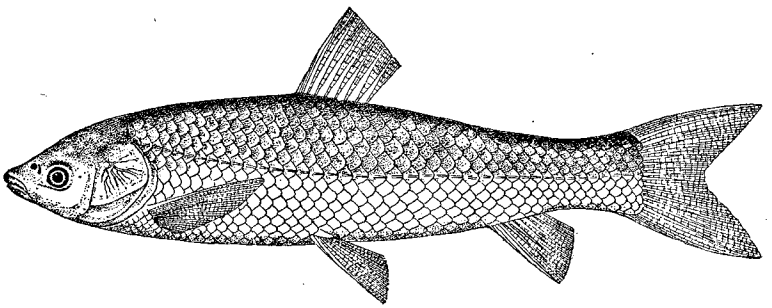

Fig. 51. *Ctenopharyngodon idellus* (C.V.). × 1/7.

Praeorbital rounded-triangular, its breadth nearly equal to eye and more than the hindmost suborbital. Operculum thick, strongly vaulted, with numerous irregular grooves for blood vessels. Gillrakers lanceolate, short, rather widely set. Pseudobranchiae present. Gillopenings wide, gillmembranes attached to isthmus somewhat behind vertical through hindborder of eye. Pharyngeal teeth 5.2—2.4; those of the outer series very strong, strongly compressed, laterally folded, their narrow masticatory surface denticulated. Distribution as that of the single species known.

1. Ctenopharyngodon idellus (C.V.).

Leuciscus idella Cuvier & Valenciennes, Hist. nat. Poissons XVII. 1844, p. 362.
Leuciscus idella Richardson, Report Ichth. China & Japan in Report British Assoc. London 1846, p. 297.
Leuciscus tschiliensis Basilewsky, Nouv. Mém. Soc. Nat. Moscou X. 1855, p. 233.
Ctenopharyngodon laticeps Steindachner, Ichth. Mitth. IX. in Verhandl. zool. bot. Ges. Wien XVI. 1866, p. 782.
Ctenopharyngodon idellus Günther, Cat. Brit. Mus. VII. 1868, p. 261.
Leuciscus idellus Bleeker, Verh. Akad. Amsterdam XII. 1871, Memoire Cyprin. de Chine p. 47.

Ctenopharyngodon idellus Jordan & Evermann, Proc. U. S. Nat. Mus. XXV. 1902, p. 322.

Ctenopharyngodon idellus Duncker, Mitt. Nat. hist. Museum Hamburg XXI. 1904, p. 183.

D. 3.7; A. 3.8; P. 1.20; V. 2.8; L. l. 40—42; L. tr. $\frac{7}{1}$.

Height about equal to length of head, which is somewhat less than one fourth of the length without caudal. Eye less than 6 to nearly 7 in large specimens, more than twice in snout; interorbital space about equal to half length of head. 4—4½ series of scales between lateral line and base of ventrals; least height of caudal peduncle surrounded by 16 scales, 7 of which above lateral lines. Ventrals shorter than pectorals, which are longer than head without snout. Caudal deeply incised, equal to or shorter than head. Length 680 mm. [More than 900 mm. according to HERZENSTEIN & WARPACHOWSKI].

Nom. indig.: Hwan (Chinese).

Habitat: Sumatra (Kota radja, in a Chinese fish pond, introduced!). — Malacca at Kwala Lumpur, introduced [Duncker], Central Asia, China, Formosa.

9. **Dangila** Cuvier & Valenciennes.

(CUVIER & VALENCIENNES, Hist. Nat. Poissons XVI. 1842, p. 229).

Oblong, compressed. Snout more or less depressed, obtusely rounded or subtruncate, generally with several series of shallow round pores, frequently carrying horny tubercles, its anterior

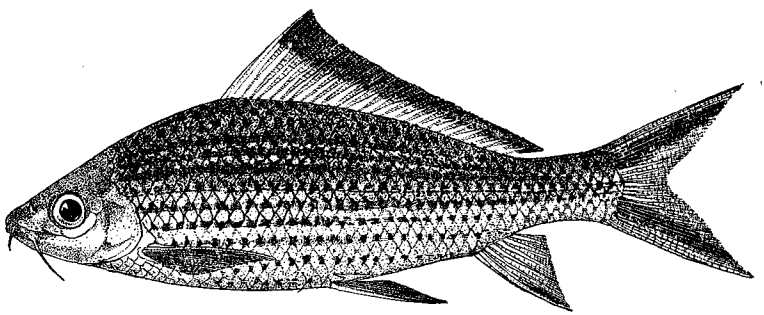

Fig. 52. *Dangila festiva* (Heck.). × ½.

border forming a pendulous fold with an entire border, covering the upper lip, which is pendulous and fringed and continuous with the lower lip. Lower lip connected at the corner of the transverse, inferior mouth with the sharp edge of the mandible,

otherwise separated from it by a narrow furrow. Postlabial groove only laterally developed. A small tubercle at the inner-side of the symphysis of the lower jaw. A rostral and a maxillary pair of barbels. Eye with a free circular rim, more developed anteriorly. Dorsal elongate, commencing before ventrals and ending above anal, without osseous ray and with 21 to about 30 branched rays. Anal short, with five branched rays. Scales small or moderate. Lateral line complete, running along the middle of the tail. Sensory tubes undivided. No sensory folds on head. Gillmembranes united and united to isthmus. Gillopenings rather wide, reaching nearly opposite to hindborder of eye. Pharyngeal teeth obliquely truncate, 5.4 or 3.2—2.4 or 3.5.

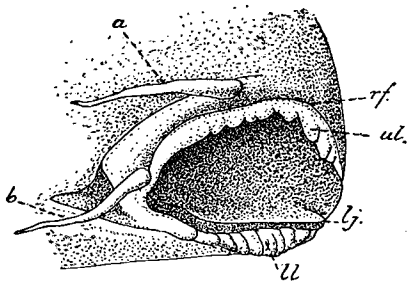

Fig. 53. Mouth of *Dangila*. *a* rostral, *b* maxillary barbel; *lj* lower jaw with sharp edge; *ll* lower lip; *rf* rostral fold; *ul* upper lip. × 5.

Distribution: Indo-australian Archipelago (Sumatra, Java, Borneo), Philippines, Malacca, Tenasserim, Burma, Siam, China.

Key to the indo-australian species.

A. Linea lateralis with more than 60 scales. . . . . *D. ocellata* p. 114.

B. Linea lateralis with 50—53 scales . . . . . *D. fasciata* p. 114.

C. Linea lateralis with less than 50 scales.

1. 39—41 scales in lateral line, above it $6\frac{1}{2}$—7 transverse series of scales.
   - *a.* Head 4.7—5.2 times in length . . . . . *D. cuvieri* p. 115.
   - *b.* Head somewhat more than 4 times in length . . *D. kuhli* p. 117.
2. 36—38 scales in lateral line.
   - *a.* Linea transversalis $\frac{6}{1}$ / $\frac{6\frac{1}{2}}{}$. D. 4.22—23. . . . . *D. sumatrana* p. 117.
   - *b.* Linea transversalis $\frac{8}{1}$ / $\frac{}{7\frac{1}{2}}$. D. 4.25—26. . . . . *D. festiva* p. 118.

Note: BLEEKER mentions in Natuur- en Geneeskund. Archief voor Nederl. Indië II (3), 1845, p. 513, a fish, called by the natives of Batavia „Ikan Mielim", as *Dangila urostigma* Val. He gives no description or further explanation of this fish. We are not aware, that VALENCIENNES described a fish under this name.

1. Dangila ocellata (Heck.).

Cyrene ocellata Heckel, Russegger's Reisen I. 2 Theil, Fische Syriens 1843, p. 1025.
Dangila microlepis Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 595.
Dangila ocellata Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 194. — Atl. Ichth. III. 1863, p. 43.
Dangila ocellata Günther, Cat. Brit. Mus. VII. 1868, p. 37.

D. 4.27—28; A. 3.5; P. 1.15—18; V. 1.8; L. l. 66; L. tr. $\frac{13—16}{1}$ $\frac{}{15—17}$.

Height about 3.3, 4.1—4.5 in length with caudal. Head about 4.5, 5.5—6 in length with caudal. Eye 3, equal to snout, but much shorter than flat interorbital space. Conspicuous pores anteriorly on the snout, generally in two rows. Maxillary barbels equal to eye or shorter, rostral ones shorter. Origin of dorsal opposite to 12th or 13th scale of lateral line, separated by 20—24 scales from occiput. Dorsal elevated in its anterior part, longest rays about equal to length of head. Anal with the anterior rays prolonged, about $^1/_6$ shorter than length of head, its origin opposite to about 46th scale of lateral line and to 23rd branched ray of dorsal. Ventrals and pectorals subequal. Ventrals surpassing anus, their origin separated by 10—11 scales from about 42nd scale of lateral line and opposite to 7th branched ray of dorsal. Pectorals shorter than head. Caudal deeply incised, the lobes pointed, equal to or longer than height of body. Least height of caudal peduncle more than twice in head, about 1.4—1.6 in its own length, surrounded by 28 scales. Silvery, back dark. A black spot edged with yellow below lateral line, situated above middle of pectoral, and another at the end of the lateral line. Finmembrane of dorsal darkish, caudal with a dark hue. Length about 220 mm.

Nom. indig.: Luma (Lampong); Lamba or Lambak (Palembang, Djambi).

Habitat: Sumatra (Pangabuang, Palembang!, Lahat, Lematang Enim, Gunung Sahilan!, Sungei Mahe, Danau Sialong lotong, river Kwantan, Indragiri, Djambi!); Borneo (river Kapuas: Pontianak, Sintang!, Sebruang, Knapei, Selimbau!, Putus Sibau, Bunut!, Danau Sriang, and its affluent river Mendalam!, river Kahajan, river Mahakam!).

2. Dangila fasciata Blkr.

Dangila fasciata Bleeker, Nat. Tijdschr. Ned. Ind. IV. 1853, p. 297; Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 195. — Atl. Ichth. III. 1863. p. 44.

Dangila taeniata Günther, Cat. Brit. Mus. VII. 1868, p. 38.
Dangila fasciata Popta, Notes Leyden Museum XXVII. 1906, p. 84.

D. 4.27—30; A. 3.5; P. 1.17; V. 1.8; L. l. 50—53; L. tr. $\frac{9}{1}$.
$\frac{}{9}$

Height 3.3—3.5, 4.3—4.6 in length with caudal. Head 4.3—4.4, 5.6—5.7 in length with caudal. Eye about 3, about equal to snout but much shorter than interorbital space. On the top of the snout two series of conspicuous pores, separated by a deep transverse furrow, the upper pores decreasing in size, reaching nearly to below nostrils. Maxillary barbels much longer than eye, the rostral ones shorter. Origin of dorsal opposite to 11th or 12th scale of lateral line, separated by 14—16 scales from occiput. Height of dorsal decreasing gradually hindwards, its longest rays somewhat shorter than length of head. Anal nearly truncate, its longest ray about equal to head without snout, its origin opposite to 25th scale, and to 21st or 22nd branched dorsal ray. Ventrals equal to pectorals, reaching anus, separated by 6 scales from 19th to 20th scale of lateral line, and opposite to 7th branched dorsal ray. Pectorals somewhat shorter than head. Caudal deeply incised, the lobes pointed, about equal to height of body. Least height of caudal peduncle more than twice in length of head, about 1.4 in length of peduncle, surrounded by 20 scales. A brownish streak along each series of scales, that of the lateral line more distinct. Upper and lower margin of the caudal and in a less degree its hind margin blackish. Dorsal fin darkish, other fins hyaline. Length 263 mm.

Nom. indig.: Masik, Ma (Bulit).

Habitat: Sumatra (Pangabuang, Benakat on river Lematang ilir, Palembang, Taluk!, Djambi!); Borneo (river Kapuas: Pontianak, river Raun, affluent of river Mandai and river Bulit).

3. **Dangila cuvieri** C.V.

Dangila Cuvieri Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 230.
Dangila leptocheila Cuvier & Valenciennes, Ibid. p. 234.
Dangila Cuvieri? Bleeker, Verh. Bat. Gen. XXIII (1849) 1850, Ichth. Midden en Oost-Java p. 19.
Dangila leptocheilus Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 198. — Atl. Ichth. III. 1863, p. 45.
Dangila cuvieri Günther, Cat. Brit. Mus. VII. 1868, p. 38 [1]).

1) Günther states that there are $3\frac{1}{2}$ scales between the lateral line and the root of the ventral fin, this must be a misprint, as well as that there are $5\frac{1}{2}$ rows of scales below the lateral line in the linea transversalis.

Dangila cuvieri Fowler, Proc. Acad. Nat. Sc. Phil. (2) LVII. 1905, p. 479.
Dangila koedjem Popta, Notes Leyden Mus. XXIV. 1904, p. 192. — ibid. XXVII. 1906, p. 81.
Dangila rosea Popta, Notes Leyden Mus. XXIV. 1904, p. 193. — ibid. XXVII. 1906, p. 85.

D. 4.21—26; A. 3.5; P. 1. 16—17; V. 1.8; L. l. 39—41; L. tr. $\frac{7\,(6\frac{1}{2})}{1}$.
$\frac{}{7—8\frac{1}{2}}$

Height 3.3—3.7; 4.4—4.7 in length with caudal. Head 4.7—5.2, 6—6.5 in length with caudal. Eye 2.7—3, about equal to snout and somewhat shorter than interorbital space. About two series of pores in the forepart of the snout. Maxillary barbels longer than eye and than rostral ones. Origin of dorsal opposite to 8th to 10th scale of lateral line, separated by 11—12 scales from occiput. Dorsal with the anterior rays prolonged, about as long as head or longer. Anal with the anterior rays prolonged, shorter than head. Origin of anal opposite to 26th or 27th scale of lateral line and to 19th—22nd branched dorsal ray. Ventrals and pectorals subequal. Origin of ventrals separated by 5 scales from 14th to 15th scale of lateral line and opposite to 5th—7th branched dorsal ray. Ventrals reaching anus or nearly so. Pectorals equal to or shorter than head. Caudal deeply incised, the lobes pointed, longer than head. Least height of caudal peduncle more or less than twice in length of head, about 1.3 in its own length, surrounded by 16 to 18 scales. Silvery, back dark. Faint dark streaks corresponding to the longitudinal series of scales, mostly composed of small patches on the scales, not visible in alcohol specimens, often with an indication of a large dark blotch at the end of the lateral line. Fins with a dark hue, especially on the free margin of the dorsal. Length to about 300 mm.

Nom. indig.: Umbu-Umbu, Lambah passir and Kepras (Djambi); Wadon gunung, Millem (Malay. Batavia); Nilem, Tiworo (Sundan.); Wader, Lokas (Javan.); Kudjem (Bulit).

Habitat: Sumatra (Palembang!, river Batang Hari, Djambi!, Selapian river); Java (Batavia, Sunter!, Perdana, Lebak, Tjampea, Buitenzorg, Tjikao, Rawah bening near Tulung agung!, Ngawi, Surabaya); Borneo (river Kapuas: Pontianak, Sintang!, Putus Sibau!, Mendalam river!, river Bulit, river Mahakam and its affluent river Bo; Tepu, Baram river). — Malacca.

4. Dangila kuhli C.V.

Dangila Kuhlii Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 231.
Dangila Kuhli Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 197. — Atl. Ichth. III. 1863, p. 44.
Dangila kuhlii Günther, Cat. Brit. Mus. VII. 1868, p. 39.

The only difference from the preceding species (*D. cuvieri*), after the few available specimens, is, that the head is larger, going somewhat more than 4 times in the length and about $5^1/_2$ times in the length with caudal.

Nom. indig.: Wadon gunung, Millem (Malay. Batavia).

Habitat: Sumatra (Laut Tador, Gunung Sahilan!, Deli); Java (Batavia).

5. Dangila sumatrana Blkr.

?*Cyrene philippina* Heckel, Russegger's Reisen I. 2. Theil, Fische Syriens, 1843, p. 1025.
Dangila sumatrana Bleeker, Nat. Tijdschr. Ned. Indië III. 1852. p. 596; Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 200. — Atl. Ichth. III. 1863, p. 46.
Dangila sumatrana Günther, Cat. Brit. Mus. VII. 1868, p. 39.
Dangila sumatrana Popta, Notes Leyden Mus. XXVII. 1906, p. 84.

D. 4.22—23; A. 3.5; P. 1.15; V. 1.8; L. l. 37—38; L. tr. $\frac{6}{1}$.
$\frac{}{6^1/_2}$

Height 3.5—4; 5 or more in length with caudal. Head 4.4—5, 6.2 in length with caudal. Eye about 3, about equal to snout and somewhat shorter than interorbital space. Snout with numerous small pores in front. Maxillary barbels much longer than eye and than rostral ones. Origin of dorsal opposite to 9th scale of lateral line, separated by about 11 scales from occiput. Dorsal with the anterior rays prolonged, the longest rays about equal to height of body. Anal slightly emarginate, its height about equal to length of head. Origin of anal opposite to 26th scale of lateral line and to 19th branched dorsal ray. Pectorals and ventrals subequal; origin of ventrals separated by 4 scales from 13th scale of lateral line and opposite to 5th branched dorsal ray. Ventrals surpassing anus. Pectorals longer than head. Caudal deeply incised, the lobes pointed, much longer than height of body. Least height of caudal peduncle about twice in head and $1^1/_2$ in its own length, surrounded by 16 scales. Colour of formol specimens brownish, back darker with a dark diffuse black longitudinal band along the body. A median dark band along the back. Fins with a darkish hue. Length 185 mm.

Nom. indig.: Kudjem (River Bŏ).

Habitat: Sumatra (Solok, Lahat); Borneo (river Bŏ!). — Philippines (?).

6. **Dangila festiva** (Heck.). [Fig. 52, p. 112].

Cyrene festiva Heckel, Russegger's Reisen, Fische Syriens, I. 1843, p. 1025.
Dangila festiva Bleeker, Act. Soc. Scient. Ind. Neerl. II. 1857, p. 16. — Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 202. — Atl. Ichth. III. 1863, p. 47.
Dangila festiva Günther, Cat. Brit. Mus. VII. 1868, p. 39.
Dangila festiva Steindachner, Sitzber. Akad. Wien LXXXIII. 1881, Ichth. Beiträge XI. p. 403.
Dangila festiva var. *stercus-muscarum* Vaillant, Notes Leyden Mus. XXIV. 1902, p. 87.

D. 4.25—26; A. 3.5; P. 1.17—19; V. 1.8; L. l. 36—38; L. tr. $\frac{8}{1}$.
$7\frac{1}{2}$

Height more or less than 3, about 4 in length with caudal. Head 4.3—4.5, 5.7—5.8 in length with caudal. Eye more than 3, somewhat shorter than snout, much shorter than interorbital space. Maxillary barbels longer than eye and than rostral ones. Origin of dorsal opposite to 8th scale of lateral line, separated by 11—12 scales from occiput. Height of dorsal regularly decreasing hindwards, the longest rays nearly equalling length of head. Anal slightly emarginate, its longest rays about $^3/_4$ length of head, its origin opposite to 26th or 27th scale of lateral line and to 21st to 23rd branched ray of dorsal. Ventrals and pectorals subequal. Origin of ventrals separated by 5 scales from the 13th or 14th scale of lateral line, opposite to the 7th or 8th scale of lateral line. Ventrals reaching or surpassing anus. Pectorals slightly shorter than head. Caudal deeply incised, the lobes pointed, somewhat shorter than height of body. Least height of caudal peduncle more than twice in length of head, about 1.5 in its own length, surrounded by 16 scales. Silvery, back dark. The longitudinal rows of scales with a faint dark line, containing dark spots corresponding to the base of each scale. Free margin of dorsal black, increasing in height anteriorly. A black band along the middle of each caudal lobe. Other fins darkish. Length 240 mm.

Habitat: Borneo (river Kapuas: Smitau, Putus Sibau!, Danau Sriang; river Kahajan, river Teweh, affluent of river Barito).

Doubtful species.

Dangila lipocheilus (Kuhl & van Hasselt) Blkr. (nec C.V.), from Java, is founded on a drawing made by KUHL and VAN HASSELT

and reproduced by BLEEKER (Atl. Ichth. III. 1863. p. 48, Cyprin. Tab. VII, fig. 1). No specimens are known.

10. **Barynotus** Günther.

(GÜNTHER, Cat. Brit. Mus. VII. 1868, p. 61).

Elongate. Head pointed. Skin of head gelatinous, with a multitude of parallel more or less wavy sensory lines. Praeorbital subtriangular, with the top directed forward, its lower margin subhorizontal, covering the maxillary and hindpart of the upper lip. Mouth inferior, horseshoe-shaped with thick continuous lips. A barbel behind corner of mouth, a much smaller rostral barbel may be deficient on one or both sides.

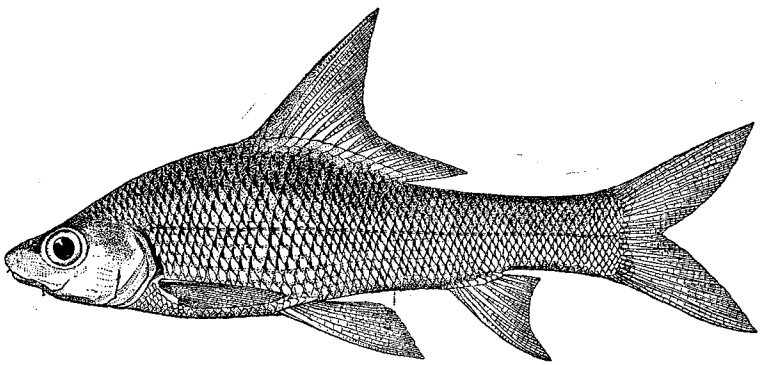

Fig. 54. *Barynotus microlepis* (Blkr.). × 1/3.

Eye large, with a kind of a circular adipose eyelid. Dorsal long, with 14—18 branched rays, its origin before that of ventrals, its end far before origin of anal. Anus nearly in the middle between base of ventrals and anal. Base of dorsal and anal in a scaly sheath. Scales small. Pseudobranchiae present. Gillrakers short, cylindrical, with a swollen base, widely set, 9 on first arch. Pharyngeal teeth 5.3.2—2.3.5, conical, their point slightly hooked. Gillopenings rather narrow, reaching to below hindborder of operculum. Gillmembranes broadly united to isthmus.

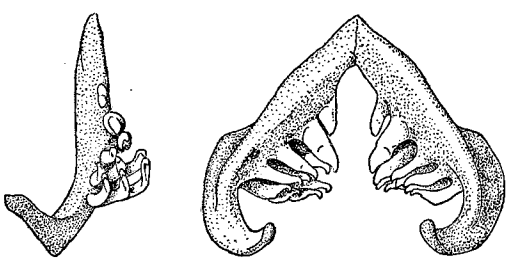

Fig. 55. Pharyngeal teeth of *Barynotus microlepis* (Blkr.) × 2.

Distribution: Freshwater of Sumatra and Borneo.

According to our opinion *Barynotus lagensis* Gthr. does not belong to this genus, but belongs to *Barbus* s. lat., where this species has been placed by BOULENGER (Cat. Freshwater fishes Africa II. 1911, p. 100). Thus *Barynotus* only contains the one species from the Indo-australian Archipelago.

1. **Barynotus microlepis** (Blkr.). [Fig. 54 and 55 p. 119].

Capoëta microlepis Bleeker, Nat. Tijdschr. Ned. Indië II. 1851, p. 206.
Cyclocheilichthys (Siaja) microlepis Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 371. — Atl. Ichth. III. 1863, p. 85.
Barynotus microlepis Günther, Cat. Brit. Mus. VII. 1868, p. 61.

D. 4.14—18; A. 3.5; P. 1.16—19; V. 2.9; L. l. 56—60; L. tr. $\frac{10}{1}$.
$\frac{}{8\frac{1}{2}(9)}$

Elongate. Profile of back ascending from snout to dorsal, arched behind head. Height nearly $3^1/_3$, more than 4 in length with caudal. Head 3.7 to somewhat less than 4, less than 5 in length with caudal. Eye 3.2—4, about equal to snout and to slightly concave interorbital space, in specimens over 400 mm. length the eye is shorter than the snout and $1^1/_2$ in interorbital space. Vertical through origin of dorsal runs through the 13th scale of lateral line and is about $^5/_6$ of length of head nearer to snout than to base of caudal. Dorsal separated by 17 or 18 scales from occiput, strongly concave. Its last spine articulated in its distal half, bluntly denticulated behind, somewhat longer than head. Anal concave, its third spine about $^1/_3$ shorter than head. Ventrals nearly equal to head, not reaching anal but surpassing anus. Origin of ventrals separated by $5^1/_2$ scales from the 16th or 17th scale of lateral line. Pectorals about $^1/_6$ shorter than head, reaching ventrals. Caudal deeply forked, its lobes rounded, about equal to head. Least height of caudal peduncle $^3/_5$ of its length, slightly less than half head. 21 or 22 scales round caudal peduncle, 10 or 11 of which above lateral lines. Silvery, upper surface dark. Scales, except the ventral ones, with a dark base. Lower half of body and tail with longitudinal darkish bands running between the rows of scales. A black band behind operculum. Dorsal and caudal blackish, the other fins in a less degree. Length over 400 mm.

Habitat: Sumatra (Palembang, Djambi!); Borneo (river Kapuas: Pontianak, Sebruang, Knapei, Danau Sriang; Barito river: Banjermassin).

11. Thynnichthys Bleeker.

(BLEEKER, Nat. Tijdschr. Ned. Indië XX. 1859—1860, p. 417. — Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 306).

Oblong. Dorsal profile from snout to dorsal somewhat angular. Ventral profile convex. Head pointed, broadened, with the interorbital space very convex. Praeorbital nearly triangular, with the point looking forwards. Suborbitals rather narrow. Opercles with a large flap. Eyes lateral, in the middle of the depth of the head, looking somewhat downwards, with a free orbital margin, anteriorly developed into a short gelatinous eyelid. Mouth anterior and lateral, its gape rather narrow. Upper jaw moderately protractile. Lower jaw angular at the symphysis. Integument on head very thin. No upper lip. Lower jaw

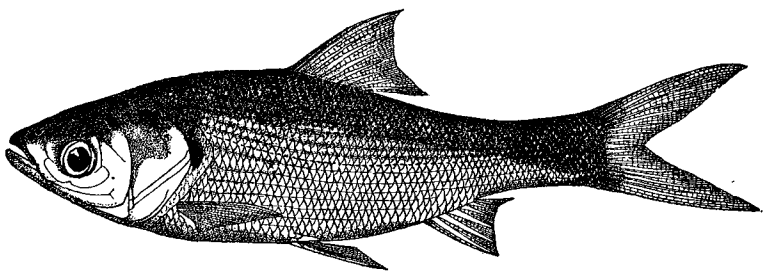

Fig. 56. *Thynnichthys thynnoides* (Blkr.). × 0.4.

with a thin labial fold at the sides only. No barbels. Origin of dorsal slightly before that of ventrals. Dorsal without osseous rays, with 8—10 branched rays. Anal short, with 5 branched rays. Pectorals shorter than head. Caudal bifurcate. Scales small. Lateral line slightly curved, running to the centre of the base of the caudal fin or a little lower. No pseudobranchiae. No gillrakers. Gilllamellae long. Gillopenings narrow, subvertical, gillmembranes broadly united to isthmus. Pharyngeal teeth with a flat, oblong crown. 5 or 4. 4 or 3. 3 or 2—2 or 3. 3 or 4. 4 or 5, the three series being wedged into one another.

Distribution: Fresh water of British India, Sumatra and Borneo.

Key to the indo-australian species.

a. Linea lateralis 47, 11 scales between lateral line and dorsal . . . . . *Th. vaillanti* p. 122.

b. Linea lateralis 58—60, 13 scales between lateral line and dorsal . . . . . *Th. thynnoides* p. 122.
c. Linea lateralis 65—75, 16—17 scales between lateral line and dorsal . . . . . *Th. polylepis* p. 123.

1. Thynnichthys vaillanti n. sp.

Thynnichthys thynnoides Vaillant, Notes Leyden Mus. XXIV. 1902, p. 102 (nec Bleeker).

D. 4.8; A. 3.5; P. 1.17; V. 1.8; L. l. 47; L. tr. $\frac{11}{1}$ / $12\frac{1}{2}$.

Height 3, 3.7—3.9 in length with caudal. Head 3—3.2, 4 in length with caudal. Eye 4.4—5, shorter than snout, nearly twice in the strongly convex interorbital space. Origin of dorsal opposite to 11th—12th scale of lateral line, much nearer to snout than to root of caudal, separated by 19—20 scales from occiput. Dorsal concave, its second branched ray opposite to origin of ventrals, its height somewhat less than length of head. Anal concave, its height equal to length of snout and eye. Pectorals and ventrals nearly equal. Ventrals surpassing anus. Pectorals about $^2/_3$ length of head. Caudal bifurcate, somewhat shorter than head. Least height of caudal peduncle $1^1/_2$ times in its own length, surrounded by 27 scales. Silvery, upper surface dark. Fins, at least distally, dusky. Length 264 mm.

Habitat: Borneo (river Mahakam: Tepu, Kota Bangun!). VAILLANT l. c. has already observed the difference in the number of scales in his specimens and in *Th. thynnoides*.

2. Thynnichthys thynnoides (Blkr.). [Fig. 56, p. 121].

Leuciscus thynnoides Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 599.
Thynnichthys thynnoides Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 408. — Atl. Ichth. III. 1863, p. 130.
Thynnichthys thynnoides Günther, Cat. Brit. Mus. VII. 1868, p. 158.

D. 3.8 (9); A. 3.5; P. 1.17—18; V. 2.8; L. l. 58—60; L. tr. $\frac{13}{1}$ / $12\frac{1}{2}$.

Height about 3.2, somewhat more than 4 in length with caudal. Head 3.2—3.4, 4—4.3 in length with caudal. Eye about 4, shorter than snout, nearly twice in the strongly convex interorbital space. Origin of dorsal opposite to 14th or 15th scale of lateral line, much nearer to snout than to root of caudal, separated by about 30 irregular rows of scales from occiput. Dorsal concave, its second branched ray opposite to

origin of ventrals, its height about equal to head without snout. Anal concave, its height about equal to length of snout and eye. Ventrals somewhat shorter than pectorals, not reaching anus or nearly so. Pectorals nearly $^2/_3$ of length of head. Caudal bifurcate, somewhat shorter than head. Least height of caudal peduncle twice or somewhat more in its length, surrounded by 26 scales. Silvery, upper surface dark. A black spot on opercular flap. Fins hyaline, dorsal and caudal somewhat dusky. Length 230 mm.

Nom. indig.: Lambak and Ringan (Djambi); Ikan Lumoh (Palembang); Ikan Pingan (Indragiri, Danau Sialong lotong).

Habitat: Sumatra (Palembang!, Djambi!, River Kampar: Gunung Sahilan! — river Kwantan: Ringat! Taluk! — Danau Sialong lotong); Borneo (without exact locality).

3. Thynnichthys polylepis Blkr.

Thynnichthys polylepis Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 407. — Atl. Ichth. III. 1863, p. 129.
Thynnichthys polylepis Günther, Cat. Brit. Mus. VII. 1868, p. 158.
Thynnichthys polylepis Vaillant, Nouv. Arch. Mus. Hist. Nat. (3) V. 1893, p. 84.
Thynnichthys polylepis Vaillant, Notes Leyden Mus. XXIV. 1902, p. 103.

D. 3.8—10; A. 3.5; P. 1.17—18; V. 2.8; L. l. 65—75; L. tr. $\frac{16—17}{1}$.
$\frac{}{16}$

Height 3.2—3.4, 4.3—4.5 in length with caudal. Head about 3.2, about 4,2 in length with caudal. Eye about $3^2/_3$, equal to snout, $1^1/_3$ in rounded interorbital space. Origin of dorsal much nearer to end of snout than to base of caudal, opposite to 15th or 16th scale of lateral line; about 25 or 26 scales in front of it. Dorsal concave, its height shorter than length of head, its second branched ray opposite to origin of ventrals. Anal concave, its height equal to snout and eye. Ventrals somewhat shorter than pectorals, reaching anus. Pectorals nearly or quite equal to head without snout. Caudal bifurcate, the lobes somewhat pointed, about equal to head. Least height of caudal peduncle about $^2/_3$ of its length, surrounded by 35 or 36 scales. Silvery, back dark. Fins hyaline, tip of dorsal and of caudal lobes more or less dusky. Length over 180 mm.

Nomen indig.: Lomopoko (Palembang).

Habitat: Sumatra (Palembang!, Danau Sialong lotong); Borneo (river Kapuas: Pontianak, Putus Sibau, Danau Sriang — Mendalam river!).

12. Osteochilus Günther.

(GÜNTHER, Cat. Brit. Mus. VII. 1868, p. 40).

Oblong, compressed. Eye with a free circular rim. Snout more or less pointed, sometimes with large or smaller pores with horny tubercles, slightly prominent, its anterior border forming a

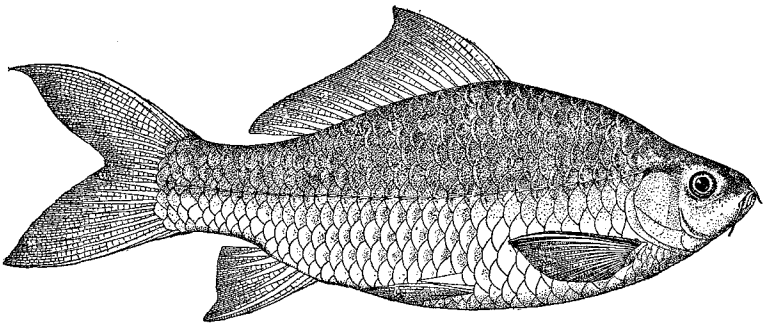

Fig. 57. *Osteochilus hasselti* (C.V.), less than half nat. size.

pendulous rostral fold, with an entire border, without lateral lobe and covering the upper lip, which is fimbriate and continuous with the lower one. Lower lip papillate or fimbriate and broadly confluent with the isthmus, its postlabial groove is only laterally developed and continued anteriorly round the commissure of the lips. Mouth protractile, transverse, inferior or subinferior. The osseous part of the mandible forms a hard sharp transverse prominence. No symphysial tubercle. Two maxillary barbels and generally two rostral ones. Dorsal without osseous rays, long, with 10—18 branched rays, beginning before ventrals and ending before, above or behind origin of anal. Anal short, with 5

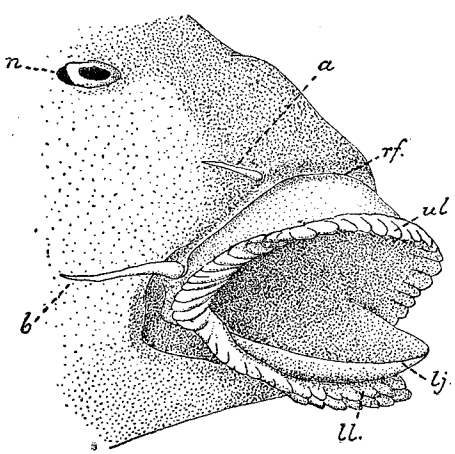

Fig. 58. Snout of *Osteochilus hasselti* (CV.), × 5. *a* rostral, *b* maxillary barbel; *lj* lower jaw with sharp bony edge; *ll* lower lip; *n* nostril; *rf* rostral fold; beyond which the parts of the mouth are protracted; *ul* upper lip.

branched rays. Scales moderate. Lateral line complete, running in the middle of the tail, sensory tubes undivided. No sensory folds on head. Gillmembranes broadly united to the isthmus. Pharyngeal teeth 5.4.2—2.4.5.

Distribution: Fresh water of Sumatra, Java, Borneo, Banka, Singapore, Malacca, Siam, Tonkin, Burma.

Key to the indo-australian species of *Osteochilus*.

I. L. l. 45—53.

1. L. tr. $\frac{8—8\frac{1}{2}}{9\frac{1}{2}}$. L. l. 47—49. Pores on snout . . *O. borneensis* p. 126.

2. L. tr. $\frac{11—12}{11—12}$. L. l. 45—53. No pores on snout. *O. melanopleura* p. 127.

II. L. l. 38—39. L. tr. $\frac{7\frac{1}{2}—8}{7\frac{1}{2}—8\frac{1}{2}}$. No pores *O. kelabau* p. 128.

III. L. l. 32—36, with or without pores.

1. Caudal peduncle surrounded by 20 scales. Middle of eye in level with cleft of mouth. . . . . *O. schlegeli* p. 129.

2. Caudal peduncle surrounded by 16—17 scales. Eyes situated higher upwards.

a. Pores on snout.

a'. With 2 pores. . . . . *O. kahajanensis* p. 130.

b'. With 3 or more pores.

1) 5 series of scales between V. and L. l. *O. repang* p. 131.

2) 4—4½ series of scales between V. and L. l.

α. 5½ scales below L. l. . . . . *O. triporus* p. 133.

β. 6½ scales below L. l. . . . . *O. vittatus* p. 131.

3) 3½—4 series of scales between V. and L. l.

α. 5½ scales below L. l. . . . . *O. bellus* p. 134.

β. 6½ scales below L. l. . . . . *O. intermedius* p. 134.

b. No pores on snout.

a'. 4½—5½ series of scales between L. l. and dorsal.

1. Dorsal 3.10—11; least height of caudal peduncle 1.2—1.6 in length of peduncle . . . . . *O. brachynotopterus* p. 134.

2. Dorsal 3.12—18; least height of caudal peduncle about equal to length of peduncle . . . . . *O. hasselti* p. 135.

b'. 6½—7 series of scales between L. l. and dorsal.

1) Dorsal 3.12; L. l. 35—36; 7 scales below lateral line; lateral black band *O. waandersi* p. 136.
2) Dorsal 3.15; L. l. 32; $6\frac{1}{2}$ scales below lateral line; a black blotch nearly encircling the end of caudal peduncle . . . . . *O. kappeni* p. 137.
3) Dorsal 3.16—17; L. l. 33—34; $7\frac{1}{2}$ scales below lateral line; a round black blotch before end of caudal peduncle . . . . . *O. brevicauda* p. 138.

IV. L. l. 29—30, numerous small pores on snout.

Dorsal 3.11. L. l. $\frac{4\frac{1}{2}}{5\frac{1}{2}}$. . . . . *O. spilurus* p. 139.

Species of unknown position . . . . . *O. harrisoni* p. 139.

Note: BLEEKER mentions in Natuur- en Geneeskund. Archief voor Nederl. Indië II (3), 1845, p. 513, a fish, called by the natives of Batavia "Ikan arong arong", as *Rohita nigra*. He gives no description or further explanation of this fish. We mention it on this place, as BLEEKER understood by *Rohita* what we call *Osteochilus*.

1. Osteochilus borneensis (Blkr.).

Rohita borneensis Bleeker, Act. Soc. Scient. Indo. Neerl. II. 1857. Tiende Bijdrage Ichth. Borneo p. 17.
Rohita (Rohita) borneensis Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 164. — Atl. Ichth. III. 1863, p. 63.
Osteochilus borneensis Günther, Cat. Brit. Mus. VII. 1868, p. 41.
Osteochilus borneensis Vaillant, Nouv. Arch. Mus. Hist. Nat. (3) V. 1893, p. 74.
Osteochilus borneensis Max Weber & de Beaufort, In Maass: "Durch Zentral Sumatra" II. 1912. Fische, p. 523.

D. 3.16—17; A. 3.5; P. 1.15; V. 1.8; L. l. 47—49; L. tr. $\frac{8\,(8\frac{1}{2})}{1\quad\quad}$.
$\quad\quad\quad

15 or 16 scales from occiput. Anterior rays of dorsal somewhat prolonged, the highest one about equal to or longer than head. Origin of anal opposite to 32nd or 33rd scale of lateral line and situated behind end of dorsal. Anterior prolonged rays of anal equal to or shorter than head. Pectorals and ventrals subequal. Origin of ventrals separated by 7 scales from the 15th scale of lateral line and opposite to 3rd branched dorsal ray. Pectorals nearly equal to head. Caudal deeply emarginate, the lobes pointed, longer than head. Least height of caudal peduncle 1.6 in head, about equal to its own length, surrounded by 20—24 scales. Longitudinal darkish bands, corresponding to the series of scales. A large black blotch at the end of the caudal peduncle. [Description made after two specimens of 152 and 280 mm.]. Length 280 mm.

Habitat: Sumatra (Si-Djundjung!, Djambi!); Borneo (river Kapuas: Pontianak, Smitau and its affluent river Mandai). — Siam.

2. **Osteochilus melanopleura** (Blkr.).

Rohita melanopleura Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 430.
Rohita (Rohita) melanopleura Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 163. — Atl. Ichth. III, 1863, p. 62.
Osteochilus melanopleurus Günther, Cat. Brit. Mus. VII. 1868, p. 40.
Osteochilus melanopleurus Vaillant, Nouv. Arch. Mus. Hist. Nat. (3) V. 1893, p. 74.
Osteochilus melanopleurus Fowler, Proc. Acad. Nat. Sci. Philadelphia (2) LVII. 1905, p. 479.

D. 3.16—18; A. 3.5; P. 1.15—17; V. 1.8; L. l. 45—53; L. tr. $\frac{11—12}{1}$ $\frac{1}{11—12}$.

Height 2.7—3, 3.6—3.8 in length with caudal. Head about 4, 5 or a little more in length with caudal. Eye a little more than 4, about $1^1/_2$ in snout, and considerably more than twice in convex interorbital space, situated in the middle of the length of the head. Snout blunt, without pores, lower jaw strongly ascending from the blunt chin. Maxillary barbels longer than eye, the rostral ones shorter. Origin of dorsal opposite to about the 12th scale of lateral line, separated by more or less than 20 scales from occiput. Dorsal with the anterior rays prolonged, as high as body or shorter. Anal opposite to about 34th scale of lateral line and to the 16th branched dorsal ray, its height somewhat more or less than

length of head. Pectorals and ventrals subequal and equal to length of head. Origin of ventrals opposite to about 15th scale of lateral line and third branched dorsal ray, separated by 8 scales from the lateral line. Ventrals surpassing anus. Caudal deeply emarginate, the lobes rounded, longer than head. Least height of caudal peduncle about 1.7 in length of head, shorter than its own length, surrounded by 24—26 scales. With numerous silvery small spots, irregularly scattered. A large transverse black blotch on the side of the anterior part of the body. In young ones a round black spot near the base of the caudal. Fins blackish, their base may be pink. Length 370 mm.

Nomen. indig. Aro (Palembang).

Habitat: Sumatra (Palembang!, Indragiri, Danau Sialong lotong, Djambi!); Borneo (river Kapuas: Pontianak, Mandhor, Danau Sriang; river Kahajan; river Barito: Banjermassin; river Baram); Singapore. — Siam.

3. **Osteochilus kelabau** Popta.

Osteochilus kelabau Popta, Notes Leyden Mus. XXIV. 1904, p. 196. — Ibid. XXVII. 1906, p. 99.

D. 3.15—16; A. 3.5; P. 1.16—17; V. 1.8; L. l. 38—39; L. tr. $\frac{7\frac{1}{2}—8}{1}$.
$\frac{}{7\frac{1}{2}—8\frac{1}{2}}$

Height 3 or less, 4 or less in length with caudal. Head 4 or more, 5 or more in length with caudal. Eye in large specimens 3.5 to more than 4, much shorter than snout, twice or more in the interorbital space, situated about in the middle of the length of the head. Snout blunt, not prominent, without pores. Lower jaw very strongly ascending from chin. Maxillary barbels longer than eye, the rostral ones somewhat shorter. Origin of dorsal opposite to 9th or 10th scale of lateral line, separated by 13—16 scales from occiput. Anterior rays of dorsal not or much prolonged, in the last case about equal to height, ending above or behind origin of anal. Anal with the anterior rays more or less prolonged, in the first case reaching on caudal, their length more than that of head. Origin of anal opposite to 24th or 25th scale of lateral line and to 15th branched dorsal ray. Ventrals and pectorals subequal, or the outer rays of the ventrals prolonged and nearly reaching anal. Their origin separated by 5—5$^1/_2$ scales from 12th scale of lateral

line and opposite to 2nd branched dorsal ray. Pectorals somewhat shorter than head. Caudal deeply incised, the lobes pointed, longer than or equal to height of body. Least height of caudal peduncle 1.7—1.8 in length of head, somewhat less than its own length, surrounded by 16 or 17 scales. More or less silvery, back brownish. A dark more or less conspicuous round spot near the end of the lateral line, some scales above the middle of the pectorals, above and below lateral line, with black blotches. Length 316 mm.

Nom. indig.: Kĕlabau (Bŏ); Kĕlabo (Samarinda).

Habitat: Borneo (river Mahakam: Samarinda!, Batu Pangal!, Kota Bangun! and its affluent, river Bŏ).

4. **Osteochilus schlegeli** (Blkr.).

Rohita Schlegelii Bleeker, Nat. Tijdschr. Ned. Indië II. 1851, p. 432.
Rohita (Rohita) Schlegeli Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 169. — Atl. Ichth. III. 1863, p. 65.
Osteochilus schlegelii Günther, Cat. Brit. Mus. VII. 1868, p. 42.
Osteochilus Schlegelii Vaillant, Notes Leyden Mus. XXIV. 1902, p. 89.

D. 3.13; A. 3.5; P. 1.15—17; V. 1.8; L. l. 35; L. tr. $\frac{6\frac{1}{2}}{6\frac{1}{2}—7}$.

Height 2.3—3.1, 2.8—3.8 in length with caudal. Head 4.3—4.4, 5.3—5.4 in length with caudal. Eye 3.6—4.3, situated about in the middle of the length of the head, rather low down, the middle of the eye being in a level with the cleft of the mouth. Eye shorter than snout and more than twice to nearly thrice in convex interorbital space. Lower jaw strongly ascending from rounded chin. Maxillary barbels much shorter than eye, the rostral ones still shorter. No pores on snout. Origin of dorsal opposite to 9th scale of lateral line, separated by 11 scales from occiput. Dorsal with the anterior rays prolonged, their height somewhat or much longer than head. Origin of anal opposite to 22nd scale of lateral line, somewhat behind end of dorsal, its anterior rays strongly prolonged, not much shorter than head. Ventrals somewhat longer than pectorals, reaching anus or not so far, their origin separated by $4\frac{1}{2}$ scales from 10th scale of lateral line and opposite to the space between first and second branched dorsal ray. Pectorals somewhat shorter than head. Caudal deeply emarginate, the lobes rounded, longer than or equal to head. Least height of caudal peduncle 1.5—1.7 in length of head, equal to or shorter

than its own length, surrounded by 20 scales. Silvery, back darkish, most scales with a more or less distinct dark margin. The blackish colour of the superior part of the dorsal frequently restricted to its anterior part. Length more than 400 mm. [Description after specimens up to 404 mm.].

Nom. indig.: Aralin, Aralim, Sebrok (Palembang); Seluwang, Mera mato (Djambi).

Habitat: Sumatra (Lake Manindjau, Palembang!, Lahat, Djambi!); Borneo (river Kapuas: Pontianak, Djongkong!, river Barito: Banjermassin, river Margaraja: Prabukarta). — Siam.

5. Osteochilus kahajanensis (Blkr.)

Rohita kahajanensis Bleeker, Act. Soc. Scient. Indo-Neerl. II. 1857. Tiende Bijdr. Ichth. Borneo p. 18.

Rohita (Rohita) kahajanensis Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 180. — Atl. Ichth. III. 1863, p. 69.

Osteochilus kahajanensis Günther, Cat. Brit. Mus. VII. 1868, p. 44.

Osteochilus kahajanensis Steindachner, Abh. Senckenb. Naturf. Gesellsch. XXV. 1901, p. 452.

Osteochilus kahajanensis Popta, Notes Leyden Museum XXVII. 1906, p. 98.

D. 3.15—17; A. 3.5; P. 1.14—15; V. 1.8; L. l. 33—36; L. tr. $\frac{5\frac{1}{2}}{1}$.

Height more than 3, about 4 in length with caudal. Head 4.5 or more, 5.2 to nearly 6 in length with caudal. Eye more than 3 to 5, twice in snout and more than twice in interorbital space in large specimens, situated in the middle of the head. Snout pointed, prominent; on each side of its front a large pore. Maxillary barbels much longer than eye, the rostral ones slender and much shorter. Origin of dorsal opposite to about 8th scale of lateral line, separated by 10—11 scales from occiput. Dorsal gradually increasing in height anteriorly, its anterior rays somewhat shorter than head. Anal with the anterior rays prolonged, somewhat shorter than dorsal, its origin opposite to 21st scale of lateral line and to end of dorsal or somewhat behind it. Ventrals and pectorals subequal; ventrals ending at some distance from anus, their axillary scale very long, their origin opposite to 11th scale of lateral line and third branched dorsal ray, separated by 4 series of scales from lateral line. Pectorals shorter than head. Caudal deeply incised, the lobes pointed, nearly equal to height of body. Least height of caudal peduncle 1.8 in length of head, nearly $1\frac{1}{2}$ times in its own length, surrounded by 16 scales. In preserved specimens colour of upper

surface dark brown, lower surface lighter. A blackish spot behind upper end of gillopening; a large oval black blotch at end of tail. Length 270 mm.

Nom. indig.: Palau Bujap (Bŏ).

Habitat: Sumatra (Lahat, Upper Langkat); Borneo (river Kapuas: Putus Sibau!, river Kahajan, river Bŏ affluent of river Mahakam, river Baram). — Malacca.

6. **Osteochilus repang** Popta.

Osteochilus repang Popta, Notes Leyden Mus. XXIV, 1902—1904, p. 196. — Ibid. XXVII. 1906, p. 101.

D. 3.17; A. 3.6; P. 1.14; V. 1.8; L. l. 35; L. tr. $\frac{6\frac{1}{2}}{1}$.
$\frac{}{7}$

Height 2.3, 3.1 in length with caudal. Head 4.3, 5.3 in length with caudal. Eye 5.1, twice in snout, 3.2 in interorbital space. Snout with a median great pore and a smaller one on each side, all provided with a tubercle and arranged in a transverse line. Maxillary barbels less than twice longer than eye, rostral ones slightly longer than eye. Origin of dorsal opposite to 8th scale of lateral line, separated by 12 scales from occiput. Dorsal slightly emarginate, its longest ray nearly $^5/_8$ of height of body. Origin of anal opposite to 23rd scale of lateral line and opposite to end of dorsal. Anal reaching caudal. Ventrals slightly longer than pectorals, not reaching anal, their origin is opposite to the 12th scale of the lateral line and separated from it by 5 series of scales. Pectorals $4^3/_4$ in the length of the body. Caudal much longer than head. Caudal peduncle surrounded by 16 scales. Reddish, a large round black spot at base of caudal. Length of single specimen known 268 mm. [Type of the species in the Leiden Museum seen by us].

Nom. indig.: Rĕpang.

Habitat: Borneo (river Bŏ, affluent of river Mahakam].

7. **Osteochilus vittatus** (C.V.) [Blkr.].

Rohita vittata Cuvier & Valenciennes, Hist. Nat. Poissons, XVI. 1842, p. 267.
Rohita erythrura Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 268.
Rohita enneaporos Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 596.
Rohita (Rohita) vittata Bleeker, Ichth. Arch. Ind. Prodr. II, Cyprini 1860, p. 178. — Atl. Ichth. III. 1863, p. 68.
Rohita (Rohita) enneaporos Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 184. — Atl. Ichth. III. 1863, p. 70.
Osteochilus vittatus Günther, Cat. Brit. Mus. VII. 1868, p. 44.

Osteochilus vittatus Popta, Notes Leyden Mus. XXVII. 1906, p. 88.
Osteochilus vittatoides Popta, Notes Leyden Mus. XXIV. 1902—1904, p. 195. — Ibid. XXVII. 1906, p. 94.

D. 3.10—13; A. 3.5; P. 1.13—16; V. 1.8; L. l. 33—34; L. tr. $\frac{5\frac{1}{2}—6}{\frac{1}{6\frac{1}{2}}}$.

Height 3—3.7, 4—4.8 in length with caudal. Head 4.1—4.5, 5.2 to nearly 6 in length with caudal. Eye 3—4, shorter, even $^1/_3$ shorter than snout, twice or less than twice in interorbital space, somewhat behind middle of length of head. Snout bluntly rounded, prominent, in front with a large median pore or tubercle and a lateral smaller one on each side, the three being placed in a more or less horizontal series; there may be besides other smaller pores or they may be absent, especially so in small specimens. Maxillary barbels about as long as the eye, the rostral ones smaller. Origin of dorsal opposite to 8th or 9th scale of lateral line, separated by 10—12 scales from occiput. Anterior rays of dorsal more or less prolonged, their height equal to or more than length of head. Anal with the anterior rays prolonged, shorter than head, opposite to 21st to 23rd scale of lateral line and about 2 scales behind end of dorsal. Ventrals slightly longer than pectorals, reaching anus or not so far, or even to anal. Their origin opposite to 11th or 12th scale of lateral line and to 2nd or 3rd branched dorsal ray, separated by 4 to $4^1/_2$ scales from lateral line. Pectorals somewhat shorter than head. Caudal deeply emarginate, the lobes pointed, their length about equal to or much more than height of body. Least height of caudal peduncle 1.7 or somewhat more in length of head, 1.2—1.4 in its own length, surrounded by 16 scales. Colour of preserved specimens yellowish, back darker. Generally a black band along the lateral line, which may run to the end of the middle caudal rays. In young specimens there may be dark spots on the scales, sometimes forming rows. Sometimes one or two series of dark spots on the dorsal. Length 260 mm.

Nom. indig.: Millem (Malay. Batavia); Nillem (Sundan.), Ikan kadjong (Palembang); Palau (Bŏ); Pĕnjopa (Howong); Mĕpa (Kajan).

Habitat: Sumatra (Pangabuang, Padang, Solok!, Lahat, Lake Manindjau, Lake Singkarah!, Si-Djundjung!, Gunung Sahilan!, river Selapian, Upper Langkat, Djambi!, Palembang!);

Java (Batavia, Lebak, Buitenzorg, Tjikao, Parongkalong, Surabaya, Gempol); Borneo (river Kapuas: Pontianak, Bunut!, Putus Sibau!, Putus Genting!, Sebruang, Danau Sriang, Raun, river Bongan, river Kajan, river Mendalam, river Barito: Banjermassin, Pengaron, on one of its affluents, river Bŏ, Bluu and Howong, affluents of the upper Mahakam, Baram River, Sarawak and other rivers in North Borneo [British Museum]). — Malacca; Tonkin.

The above description is in accordance with that of BLEEKER given for *Rohita vittata*; the description of CUVIER & VALENCIENNES is too superficial to be sure that it is the same as BLEEKER's species.

BLEEKER distinguishes from this species as *R. triporus* specimens, which have one scale less beneath the lateral line, thus: $\frac{5\frac{1}{2}}{\frac{1}{5\frac{1}{2}}}$ and by having a black spot anteriorly on the base of the dorsal. In our material we find two specimens with the same characteristics and besides characterized by having only $3^1/_2$ series of scales between lateral line and origin of ventrals, but otherwise identical with *vittatus*. If this form from Borneo and Sumatra is really a good species, its synonymy would be:

7*a*. **Osteochilus triporus** (Blkr.).

Rohita triporos Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 598.
Rohita (Rohita) triporos Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 182.
Rohita (Rohita) triporus Bleeker, Atl. Ichth. III. 1863, p. 70.
Osteochilus triporus Günther, Cat. Brit. Mus. VII. 1868, p. 44.
Osteochilus triporus Vaillant, Nouv. Arch. Mus. Hist. Nat. (3) V. 1893, p. 75.

In our material of 29 specimens from Djambi, 20 are quite in accordance with the description of *O. vittatus*. Nine others differ in having a less number of scales between lateral line and dorsal, for their linea transversalis is $\frac{4\frac{1}{2}-5}{\frac{1}{6\frac{1}{2}}}$. Besides they are characterized by a black band on the outer upper and lower margin of the caudal and by a black spot anteriorly on the base of the dorsal as is also described for *O. triporus*. Two specimens from Putus Sibau on the river Kapuas, Borneo, are identical with the lastnamed 9 specimens. We propose to call them provisionally:

7*b*. Osteochilus intermedius n. sp.

The species described by Miss POPTA as:

7*c*. Osteochilus bellus Popta.

Osteochilus bellus Popta, Notes Leyden Mus. XXIV. 1902—1904, p. 197. — Ibid. XXVII. 1906, p. 104.

forms a transition between *O. triporus* and *O. intermedius*, as their linea transversalis is: $\frac{4\frac{1}{2}}{1}$ and as they have $3^1/_2$—4 series of scales between ventrals and lateral line. Moreover *O. bellus* has a black spot at the end of the lateral line. The 8 series of small spots, described by Miss POPTA, may sometimes also be found in small specimens of *O. vittatus*. *O. bellus* Popta attains 200 mm. and is found in Borneo (river Bŏ), where it is called Piit.

8. Osteochilus brachynotopterus (Blkr.).

Rohita brachynotopterus Bleeker, Nat. Tijdschr. Ned. Indie IX. 1855, p. 266.
Rohita (Rohita) brachynotopterus Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 122. — Atl. Ichth. III. 1863, p. 67.
Osteochilus brachynotopterus Günther, Cat. Brit. Mus. VII. 1868, p. 43.
Osteochilus brachynotopterus M. Weber & de Beaufort, in Maass: „Durch Zentral-Sumatra", II. 1912, Fische, p. 523.

D. 3.10—11; A. 3.5; P. 1.13—14; V. 1.8; L. l. 33—34; L. tr. $\frac{5\frac{1}{2}}{1}$.

Height about 3.5, 4.5—5 in length with caudal. Head 4 to 4.5, about 5.5—6 in length with caudal. Eye 3—3.4, shorter than snout, 1.5—1.7 in interorbital space, situated somewhat nearer to end of operculum than to tip of snout. Snout rounded, blunt, without pores. Maxillary barbels about equal to eye, rostral ones shorter. Origin of dorsal opposite to 8th or 9th scale of lateral line, separated by about 10 scales from occiput. Anterior rays may be prolonged, in that case $^2/_5$ longer than head, in others about equal to length of head. Anal concave, the first ray somewhat prolonged, shorter than head, its origin opposite to 20th or 21st scale of lateral line, behind end of dorsal. Ventrals equal to or somewhat longer than pectorals, on account of the outer prolonged rays, which reach on anal. Origin of ventrals opposite to 3rd branched dorsal ray and separated by 4—$4^1/_2$ scales from the 11th scale of lateral line. Pectorals about equal to head or shorter. Caudal deeply emarginate,

the lobes pointed, much longer than head. Least height of caudal peduncle 1.7—1.9 in length of head, and 1.2—1.6 in its own length, surrounded by 16 scales. Silvery, back darkish brown, a black band running from snout along the lateral line to base of caudal. Series of black, more or less confluent spots along the back and the base of the dorsal. Length 150 mm.

Habitat: Sumatra (Benkulen, Lahat, Taluk!, Si-Djundjung!, Benakat, Palembang).

9. **Osteochilus hasselti** (C.V.) [Fig. 57 and 58, p. 124].

Rohita Hässeltii Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 274.
Rohita microcephalus Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 275.
Rohita leiorhynchos Bleeker, Verh. Batav. Gen. XXIII, 1850, Ichth. Midden- & Oost-Java, p. 19.
Rohita Artedii Bleeker, Nat. Tijdschr. Ned. Indië II. 1851, p. 434.
Rohita Waandersii Bleeker, Nat. Tijdschr. Ned. Indië XV. 1858, p. 427 [nec Bleeker 1852].
Rohita (*Rohita*) *Hasseltii* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 171. — Atl. Ichth. III. 1863, p. 65.
Rohita (*Rohita*) *microcephalus* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 173. — Atl. Ichth. III. 1863, p. 66.
Rohita (*Rohita*) *Kuhli* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 177. — Atl. Ichth. III. 1863, p. 68.
Osteochilus hasseltii Günther, Cat. Brit. Mus. VII. 1868, p. 41.
Osteochilus kuhlii Günther, Cat. Brit. Mus. VII. 1868, p. 42.
Osteochilus microcephalus Günther, Cat. Brit. Mus. VII. 1868, p. 43.
Rohita (*Rohita*) *Hasseltii* Vinciguerra, Ann. Mus. Civ. Genova XIV. 1879, p. 388.
Osteochilus hasselti Steindachner, Abh. Senckenb. Nat. Ges. XXV. 1901, p. 454.
Osteochilus microcephalus Popta, Notes Leyden Mus. XXVII. 1906, p. 91.
Osteochilus Hasseltii Jordan & Seale, Proc. U. S. Nat. Mus. XXXIII. 1908, p. 539.

D. 3.12—18; A. 3.5; P. 1.13—15; V. 1.8; L. l. 33—36; L. tr. $\frac{4\frac{1}{2}—6}{1}$.
$\frac{}{5\frac{1}{2}—6\frac{1}{2}}$

Height 2.5—3, 3.5 to more than 4 in length with caudal. Head 4—4.5, 5—5.8 in length with caudal. Eye more than 3 to 4.5, shorter than snout, 1.7—2.5 in interorbital space. Eye about in the middle of the head. Snout bluntly rounded, somewhat prominent, without pores. Maxillary barbels equal to or longer than eye, the rostral ones shorter. Origin of dorsal opposite to 8th—10th scale of lateral line, separated by 10—11 scales from occiput. Dorsal gradually increasing in height anteriorly, the longest rays about equal to length of head. End of dorsal before or somewhat behind origin of anal. Anal more or less truncate, its height shorter than length of head,

its origin opposite to 22nd or 23rd scale of lateral line, behind last dorsal ray, opposite to it or even to the second last ray in case the dorsal is many-rayed. Ventrals and pectorals subequal. Origin of ventrals separated by 4—4½ scales from 10th—12th scale of lateral line and opposite to 1st—4th branched ray of dorsal. Ventrals not reaching anus. Pectorals somewhat shorter than head. Caudal deeply incised, the lobes more or less pointed, longer or much longer than head. Least height of caudal peduncle 1½ to nearly 2 times in length of head, about equal to its own length and surrounded by 16 scales. Young and half grown specimens with 6—8 longitudinal series of brown spots, especially on the tail, one spot being on every scale, disappearing in old examples even as a round black spot near base of caudal; other examples (colour-variety *microcephalus* Blkr.) with a darkish band along the lateral line. Length 320 mm.

Nom. indig.: Millem (Malay. Batavia); Lehat, Mangut, Regis, Nillem (Sundan.); Nillèm (Purwakarta); Monto, Areng areng? (Kediri); Palong (Lampong); Palouw (Benkulen); Pawas [young specimens], Pawas Korbao [old specimens] (Padang Pandjang); Assang (Manindjau, Singkarah), Pĕnopā (Bongan).

Habitat: Sumatra (Serdang!, Padang, Pati Bubur!, Solok!, Kalung (Tilatang) in Padangsche Bovenlanden!, Padang Pandjang, Fort de Kock!, Ringat!, Lake Singkarah!, Pajakomboh!, Lake Manindjau!, Telok Betong, Lahat, Pangabuang, Palembang, Djambi!, Deli!, Indrapura!, river Kampar: Gunung Sahilan!, river Kwantan: Taluk!, river Mahe, Lake Tador, Lake Sialong lotong, Upper Langkat, Kota radja!); Java (Sunter!, Bekassi!, Sumenap!, Batavia!, Perdana, Krawang!, Buitenzorg, Tjikao, Tjampea, Kuningan, Bandung!, Garut!, Lelles, Lake Wanajasa near Purwakarta!, Ngawi, Kediri!, Tulung Agung!, Surabaya, river Brantas!, Gempol, Djember!, Palabuan); Borneo (river Baram, Pontianak on river Kapuas and its affluents Raun and Bongan, Bankajang, river Sambas, river Barito: Banjermassin and Pengarong on one of its affluents, river Mahakam: Batu Pangal!). — Malacca, Siam.

10. **Osteochilus waandersi** (Blkr.).

Rohita Waandersii Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 733. — Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 166. — Atl. Ichth. III. 1863, p. 63.
Osteochilus waandersii Günther, Cat. Brit. Mus. VII. 1868, p. 43.
Osteochilus waandersii Boulenger, Proc. Zool. Soc. London 1890, p. 39.

D. 3.12; A. 3.5; P. 1.14; V. 1.8; L. l. 35—36; L. tr. $\frac{6\frac{1}{2}—7}{\frac{1}{7}}$.

Height $3^1/_5$, about 4 in length with caudal. Head $4^2/_5$, $5^3/_4$ in length with caudal. Eye $3^3/_4$, shorter than snout, nearly twice in interorbital space. Snout scarcely prominent, without pores; maxillary barbel about as long as eye, the rostral one much shorter. Origin of dorsal separated by 12 scales from occiput, situated before ventrals; dorsal gradually increasing, ending conspicuously before origin of anal, its height $1^2/_5$ in height of body. Anal not emarginate, much lower than dorsal. Ventrals not reaching anal, separated by $4^1/_2$ longitudinal series of scales from lateral line, shorter than pectorals, which do not reach ventrals and go $6^1/_2$ times in total length. Caudal deeply incised, lobes pointed, longer than head. Silvery, back greenish; a black band, about as broad as a scale, anteriorly narrower than posteriorly, runs along the lateral line to the end of the middle caudal rays. Length of the single specimen described 198 mm. [After BLEEKER and GÜNTHER; not seen by us].

Habitat: Banka; Sumatra (Deli).

11. **Osteochilus kappeni** (Blkr.).

Rohita Kappenii Bleeker, Act. Soc. Scient. Ind. Neerl. II. 1857, Tiende Bijdrage Ichth. Borneo, p. 19.

Rohtia (Rohita) Kappenii Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 167. — Atl. Ichth. III. 1863, p. 64.

Osteochilus kappenii Günther, Cat. Brit. Mus. VII. 1868, p. 42.

Osteochilus Kappenii Vaillant, Nouv. Arch. Mus. Hist. Nat. (3) V. 1893, p. 75.

? *Osteochilus Kappenii* Fowler, Proc. Acad. Nat. Sc. Philadelphia (2) LVII. 1905, p. 480.

D. 3.15; A. 3.5; P. 1.13; V. 1.8; L. l. 32; L. tr. $\frac{6\frac{1}{2}}{\frac{1}{6\frac{1}{2}}}$.

Height 2.5, 3.3 in length with caudal. Head 4.2, 5.6 in length with caudal. Height of head about equal to its length. Eye about 3, slightly shorter than snout, situated about in the middle of the length of the head, 1.6 in convex interorbital space. Snout blunt, scarcely prominent, without pores. Lower jaw obliquely ascending from chin. Maxillary barbels about equal to eye and much longer than the rostral ones. Origin of dorsal opposite to 9th scale of lateral line, separated by 10 scales from occiput. Dorsal with the anterior rays scarcely prolonged, somewhat longer than head. End of dorsal above anal. Anal somewhat concave, the anterior rays prolonged,

nearly reaching caudal, its height nearly equal to head. Origin of anal opposite to 21st scale of lateral line and to 13th branched dorsal ray. Ventrals and pectorals subequal. Ventrals surpassing anus, their origin separated by $4^1/_2$ scales from 11th scale of lateral line and opposite to 2nd branched ray of dorsal. Pectorals somewhat shorter than head. Caudal deeply emarginate, the lobes pointed, longer than head. Least height of caudal peduncle $1^1/_2$ times in length of head and equal to its own length, surrounded by 16 scales. Colour of preserved specimens brownish, darker above. A large black blotch nearly encircling the end of the caudal peduncle. Lower half of dorsal more or less blackish. Length 175 mm.

Nomen indig.: Ikan mas (Djambi).

Habitat: Sumatra (Djambi!); Borneo (river Kapuas, river Sambas, river Baram?).

12. **Osteochilus brevicauda** n. sp.

D. 3.16—17; A. 3.5; P. 1.13—14; V. 1.8; L. l. 33—34; L. tr. $\frac{6—6\frac{1}{2}}{1}$.
$\frac{}{7\frac{1}{2}}$

Height 2.3—2.8, 3—4 in length with caudal. Head 3.5—4.3, 5—5.4 in length with caudal. Eye 3 to more than 4, more than once to 1.8 in snout and more than twice in the flat interorbital space. Snout without pores. Maxillary barbels longer than eye, the rostral ones shorter. Origin of dorsal opposite to 8th scale of lateral line, separated by 10 scales from occiput. Anterior rays of dorsal slightly prolonged, conspicuously longer than head. Origin of anal opposite to 23rd or 24th scale of lateral line and behind end of dorsal or opposite to ultimate or penultimate branched ray. Ventrals slightly shorter than pectorals, not reaching anus in adult specimens, their origin separated by 5 or $5^1/_2$ scales from 11th or 12th scale of lateral line and opposite to 4th branched ray of dorsal. Pectorals slightly shorter than head. Caudal deeply bifurcate, much longer than head. Least height of caudal peduncle $1^1/_2$ times or more in length of head, more than length of caudal peduncle, surrounded by 16 scales. A large round black blotch somewhat before the end of the lateral line. Base of scales with a dark brown streak. In young specimens an indication of an incomplete brown vertical band above and below the lateral line, opposite the middle of the length of the pectoral. Length 230 mm.

[Type of the species in the zoological Museum of Amsterdam].

Habitat: Borneo (river Kapuas: Putus Sibau!, Putus Genting!); collected by Dr. H. A. LORENTZ.

13. **Osteochilus spilurus** (Blkr.).

Dangila spirulus Bleeker, Nat. Tijdschr. Ned. Indië I. 1850, p. 272.
Rohita oligolepis Bleeker, Nat. Tijdschr. Ned. Indië V, 1853, p. 191.
Rohita (*Rohita*) *oligolepis* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 185. — Atl. Ichth. III. 1863, p. 71.
Dangila spilurus Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 206. — Atl. Ichth. III. 1863, p. 48.
Osteochilus oligolepis Günther, Cat. Brit. Mus. VII. 1868, p. 45.
Osteochilus spilurus Günther, Cat. Brit. Mus. VII. 1868, p. 45.

D. 3.11; A. 3.5; P. 1.12; V. 1.8; L. l. 29—30; L. tr. $\frac{4\frac{1}{2}}{1}$.
$\frac{}{5\frac{1}{2}}$

Height 3.5, 4.5 in length with caudal. Head 4, 5.2 in length with caudal. Eye somewhat more than 3, shorter than snout and about 1.7 in interorbital space. Snout somewhat pointed, prominent with numerous small pores, without larger central one. Maxillary barbels much longer than eye, the rostral ones shorter. Origin of dorsal opposite to 7th or 8th scale of lateral line, separated by 10—11 scales from occiput. Dorsal gradually increasing in height anteriorly, the longest rays about equal to length of head. Anal slightly rounded, shorter than head, its origin opposite to 20th scale of lateral line and behind end of dorsal. Ventrals and pectorals equal. Ventrals not reaching anus, their origin separated by 4 scales from 11th scale of lateral line and opposite to 3rd branched dorsal ray. Pectorals somewhat shorter than head. Caudal deeply emarginate, the lobes bluntly pointed, longer than head. Least height of caudal peduncle 1.9 in head, 1.2 in its own length, surrounded by 16 scales. Colour of preserved specimens brownish, scales with a more or less distinct dark base. A large black spot near the end of the caudal peduncle. Dorsal with two series of black spots. Length more than 100 mm.

Habitat: Sumatra (river Kwantan: Taluk!, Ringat!, and its affluents; river Kampar Kiri, an affluent of river Kampar: Gunung Sahilan!, river Si Russu, Indragiri); Banka; British North Borneo [British Museum].

14. **Osteochilus harrisoni** Fowl.

Osteochilus harrisoni Fowler, Proc. Acad. Nat. Sc. Philadelphia (2) LVII. 1905, p. 480.

„Head $3^3/_4$; depth $2^4/_5$; D. 2.16; A. 3, 5.1; P. 1.15; V. 1.8; scales 33 in lateral line to base of caudal, and 2 more on latter; 6 scales between origin of dorsal and lateral line obliquely back, uppermost scale very small; 5 scales between lateral line and origin of ventral, lowest scale very small; 10 scales before dorsal; width of head $1^1/_2$ in its length; depth of head $1^1/_3$; snout $2^2/_5$; eye $4^1/_2$; width of mouth $4^1/_2$; interorbital space 2; second simple dorsal ray $1^1/_{10}$; second simple anal ray $1^1/_3$; pectoral $1^1/_5$; ventral $1^1/_6$; least depth of caudal peduncle $1^3/_4$; lower caudal lobe $3^1/_{10}$ in head and trunk; base of dorsal $2^7/_8$.

Body elongate, compressed though robust, greatest depth at origin of dorsal, and profiles more or less similarly convex. Back but little elevated and its profile convex from occiput to dorsal. Caudal peduncle robust, compressed, and its least depth about equal to its length. Head rather small, compressed, broad, robust, and both upper and lower profiles inclined similarly, also nearly straight. Snout long, broad, convex, obtuse above, and somewhat declivous in front. Eye rather small, a little posterior to middle of length of head, circular, and not much above middle of depth of head. Pupil large and circular. Mouth inferiorly terminal, broad, the gape not extending far laterally. Lips rather thick, fleshy and plicate. Jaws horny and with a rather sharp edge. Premaxillaries protractile. Four upper mental barbels, upper lateral near edge of snout, and lower at corner of mouth, also much longer or about reaching opposite middle of orbit. Nostrils adjoining anterior in a short cutaneous tube, lateral, much nearer eye than tip of snout and level with upper margin of eye. Preorbital not distinct, and together with cheek covered with skin. Interorbital space elevated a little convexly and flattened medianly. Gill-opening lateral, extending forward about opposite posterior margin of preopercle. Rakers in form of a low fringe of fine or minute filaments. Filaments long, about equal to orbit. No pseudobranchiae. Width of isthmus where gillmembranes join about equal to orbit.

Scales large, cycloid, and well exposed, also of more or less even size. Scales on breast small, especially anteriorly. Small scales along bases of dorsal and anal. A pointed scaly ventral flap in axil of fin about $^2/_5$ its length. Head and fins naked, except base of caudal. Lateral line of short exposed single tubes, and continuous even on base of caudal.

Origin of dorsal about opposite tip of depressed pectoral or a little before origin of ventral, second simple ray highest, next three graduated down, after which they are all more or less of one size. Anal beginning a trifle before base of last dorsal ray, and second simple ray also longest. Caudal forked, lobes rather pointed. Pectoral small, and inserted low. Ventral not quite reaching vent or about $^2/_3$ of space to anal.

Color in alcohol dull olivaceous-brown, paler below and on sides of head. Fins pale brownish, dorsal and caudal scarcely darker. Each series of scales marked by a bar, making about ten longitudinal dark lines or bands less in width than pupil of eye, and dusky or most distinct above lateral line. Iris olivaceous, pupil slaty. Peritoneum silvery". Length 225 mm.

Habitat: Borneo (Baram river).

„This species is close to *Osteochilus kahajanensis* (Bleeker), which has been reported from the Baram river by Dr. STEINDACHNER, but differs apparently in the distinct longitudinal narrow brown stripes. My examples also have no blue spot on the shoulder-girdle, though in alcohol the other color markings are fairly distinct." [After FOWLER, not seen by us].

We are not sure about the position of this fish, as FOWLER does not say anything about the presence or absence of pores on the snout.

13. Cosmochilus Sauvage.

(SAUVAGE, Nouv. Arch. Mus. Hist. Nat. (2) IV. 1881, p. 179).

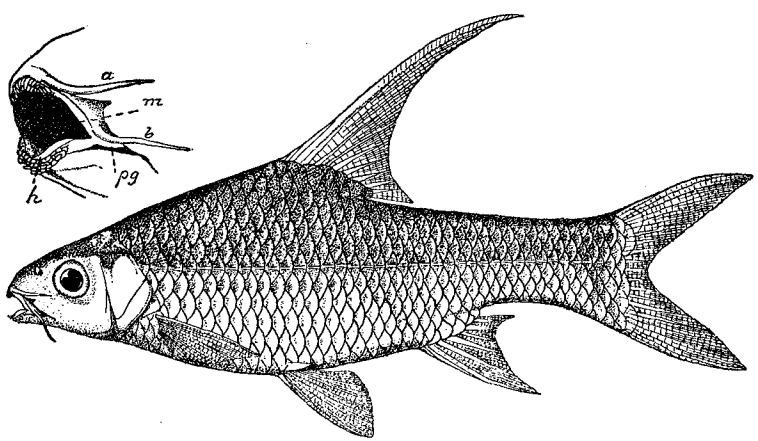

Fig. 59. *Cosmochilus falcifer* T. Regan. Upper figure: mouth (*m*), *a* rostral, *b* maxillary barbel, *h* horny sheath on lower jaw, *pg* postlabial groove.

Oblong, snout obtuse, without pores and tubercles. Mouth small, transverse, inferior, the lips thick, continuous, pendulous, provided with barbel-like fringes and with a postlabial groove, interrupted in the middle. Rostral and maxillary barbels present. Mandible with a horny sheath, without median tubercle. Dorsal opposite to ventrals, with the 4th simple ray ossified and strongly denticulated and with 8 branched rays. Anal short, with 5 to 6 branched rays. Scales moderate, lateral line running in the middle of the tail. Sensory tubes undivided, no sensory folds on head. Pharyngeal teeth 5.3.2 or 1—1 or 2.3.5, the teeth of the outer series compressed.

Distribution: The type is from Camboja and one species is known from fresh water of Borneo.

1. Cosmochilus falcifer Regan.

Cosmochilus falcifer Tate Regan, Ann. Mag. Nat. Hist. (7) XVIII. 1906, p. 66.

D. 4.8; A. 3.6; P. 1.17; V. 1.9; L. l. 36—39; L. tr. $\frac{6}{1}$ $\frac{}{7—8}$.

Somewhat elongate, dorsal profile from snout to dorsal strongly ascending in a straight line. Height 2.4—2.7, 3.4—3.6 in length with caudal. Head 4—4.4, 5.2—5.6 in length with caudal. Eye 3.6 to more than 4, 1.3 to 1.4 in snout, about $1^1/_2$ times in flattened interorbital space. Rostral barbel the longest, longer than eye. Origin of dorsal opposite to 11th scale of lateral line; separated by about 14 scales from occiput. Dorsal concave, the 4th spine articulated throughout, very elongate, when laid back reaching the caudal or nearly so, its hindborder denticulated. Anal concave. Dorsal and anal scaly at the base. Ventrals extending to vent, opposite to 10th scale of lateral line, from which they are separated by 5 scales; subequal to pectorals, which are shorter than or equal to length of head, and reach the ventrals or nearly so. Caudal deeply forked, longer than head. Least height of caudal peduncle about $1^1/_2$ times in length of head and somewhat shorter than its own length, surrounded by 16 scales, 7 of which above lateral lines. Scales with fine, undulate, longitudinal lines. Olivaceous, scales with dark diffuse spots on their posterior half.

Length 480 mm. [Type of the species in the British Museum seen by us].

Habitat: Borneo (Baram river, Kapit on river Redjang, Sarawak!).

14. Hampala Bleeker.

(BLEEKER, Nat. Tijdschr. Ned. Indië, XX, 1859—60, p. 430).

Elongate, compressed. Snout pointed. Mouth terminal, wide, oblique, extending beyond the vertical from the frontmargin of the orbit. Jaws equal in length, the upper not much protractile. The upper lip broadened anteriorly, the lower one laterally; postlabial groove (furrow) running parallel with lips, interrupted in the middle of the lower lip. A barbel behind corner of mouth. Dorsal with 8 branched rays and a low basal scaly sheath, its origin opposite to that of ventrals, its last osseous

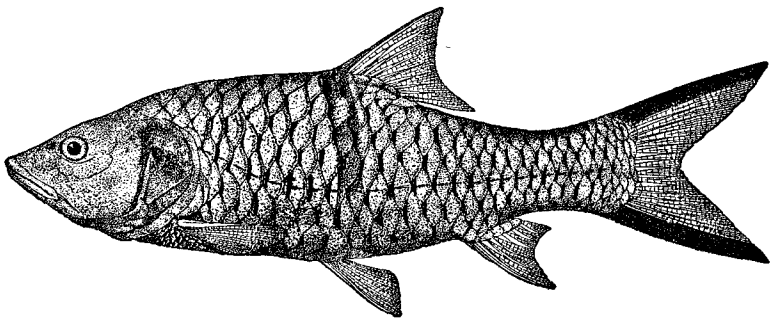

Fig. 60. *Hampala macrolepidota* (C.V.). × 2/9.

ray feeble and finely serrated. Anal with 5 branched rays. Scales large, radially striated or granulated, some with reticulated lines. Lateral line complete, somewhat curved towards belly, sensory tubes undivided. No sensory folds on head and no tubercles on snout. Gillmembranes united to isthmus, opposite to hindpart of eye. Pharyngeal teeth spoon-shaped, 5.3.1—1.3.5.

Distribution: Fresh water of indo-australian Archipelago (Sumatra, Java, Borneo); Malacca, Tenasserim, Siam, Indo-China.

Key to the indo-australian species.

A. Linea lat. 28—29.

1. A more or less distinct oblong vertical blotch between dorsal and ventral . . . . . *H. macrolepidota* p. 143.
2. Two large black blotches in lateral line. . . . . *H. ampalong* p. 145.

B. Linea lat. 25—27.

1. Two large vertical blotches on the side . . . . . *H. bimaculata* p. 146.

1. Hampala macrolepidota (C.V.).

Capoëta macrolepidota Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 280.

Capoëta macrolepidota Bleeker, Verh. Batav. Gen. XXIII. (1849) 1850, Ichthyol. Midden- & Oost-Java, p. 20.

Capoeta macrolepidota Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 1249.

Hampala macrolepidota Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 308. — Atl. Ichth. III. 1863, p. 112.

Barbus hampal Günther, Cat. Brit. Mus. VII. 1868, p. 139.

Barbus macrolepidota Day, Fishes of India 4°. 1878—1888, p. 571.

Hampala macrolepidota Fowler, Proc. Acad. Nat. Sci. Philadelphia (2) LVII. 1905, p. 486.

Barbus hampal C. V. var. *bifasciata* Popta, Notes Leyden Mus. XXV. 1904—1905, p. 173. — Ibid. XXVII. 1906, p. 147.

Barbus hampal Popta, Notes Leyden Mus. XXVII. 1906, p. 145.

D. 3.8; A. 3.5; P. 1.15—16; V. 2.8; L. l. 28—29; L. tr. $\frac{5}{1}$. $\frac{}{3\frac{1}{2}}$

Elongate, profile of back slightly elevated and arched, that of head slowly descending with a shallow concavity above and behind eyes. Height decreasing with age, 3—3.7, 3.7—4.6 in length with caudal. Head about 3, about 3.8 to more than 4 in length with caudal. Eye 3—5, nearly twice in snout in fullgrown specimens, about $1\frac{1}{2}$ in interorbital space. Snout pointed. Jaws nearly equal in length. Mouth wide, extending backwards slightly beyond vertical through frontborder of eye. Lips broadened: the upper one anteriorly, the lower lip laterally. A barbel behind corner of mouth, nearly as long as eye. Origin of dorsal opposite to 8th or 9th lateral scale and to origin of ventrals, slightly before or, in young specimens, behind middle of a line connecting end of snout and base of caudal, separated by 10 scales from occiput. Dorsal concave, the third osseous ray feeble and finely serrated, with its flexible part nearly as long as head without snout. Anal concave, its third spine equal to the dorsal one, but $\frac{1}{5}$ shorter. Ventrals separated by 2—$2\frac{1}{2}$ scales from lateral line, shorter than pectorals, far distant from anus. Pectorals more than half head, not reaching ventrals. Caudal deeply forked, shorter than head. Least height of caudal peduncle much less than its length, about $2\frac{1}{2}$ in head. Twelve scales round caudal peduncle, 5 of which above the lateral lines. Scales finely punctuated, in fullgrown specimens with some radiating lines. Silvery, back darker, a more or less distinct vertical blotch between dorsal and ventrals. Upper and lower margin of caudal black. Length 700 mm.

Nomen indig.: Ampalong (Malay. Batavia); Hampal, Hambal, Hampalong (Sundan.); Wader, Sutjo (Javan.); Polittah (small specimens), Palung (older specimens) (Kediri); Sabaju (Lampong); Kabarouw (Benkulen); Barauw and Gadi (Singkarah); Dungan (Bŏ, Borneo, Mahakam).

Habitat: Sumatra (Padang, Solok!, Lake Singkarah!, Lake Manindjau!, Pati Bubur!, river Ular: Serdang!, river Kampar: Gunung Sahilan!, river Kwantan, Upper and lower Langkat, Danau Sialong lotong, Palembang!, Lahat, river Pengabuang, Djambi!, Deli!); Java (Batavia!, Tjibiliong, Tjampea, Buitenzorg!, Pondok gedeh, Lake Kamodjing near Tjikampeh!, Garut!, Lake Bagendit!, Serogal, Parongkalong, Pandjallu, Ngawi, Surabaya, Grati, Lesti, Kediri!); Borneo (river Kapuas!, Seminis, Danau Sriang, Baram river, and other rivers in Sarawak [British Museum], Sambas, river Barito: Banjermassin, river Mahakam and river Bŏ). — Malacca; Tenasserim; Siam; Indo-China.

Miss POPTA described a specimen of 189 mm. from the river Bŏ, Borneo, as *Barbus hampal* var. *bifasciata*, distinguished by a second dark band running in the middle of the caudal peduncle. She observes, that this variety grows to a length of 500 mm. according to the collector Prof. A. W. NIEUWENHUIS. We suppose that this is the partial retention of an infantile coloration, for we have a specimen of 36 mm. from Djambi, Sumatra, which has a very distinct black vertical band between origin of dorsal and ventrals, a much less distinct one in the middle of the caudal peduncle, a curved band behind the opercle, a black band through the eye, a faint one at the base of the caudal and a faint blotch at the origin of the anal.

2. Hampala ampalong (Blkr.).

Capoëta ampalong Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 594.
Hampala ampalong Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 310. — Atl. Ichth. III. 1863, p. 113.
Barbus ampalong Günther, Cat. Brit. Mus. VII. 1868, p. 139.

D. 3.8; A. 3.5; P. 1.15; V. 2.8; L. l. 28—29; L. tr. $\frac{5}{3\frac{1}{2}}$.

Height about 3.3, 4.2 in length with caudal. Head about 3, 4 in length with caudal. Eye 4.8, $^1/_3$ shorter than snout, which is slightly more than the interorbital space. Origin of dorsal behind middle of a line connecting end of snout and base of caudal, above 9th lateral scale, separated by 10 scales from occiput. Dorsal spine distinctly serrated. Silvery, back darker. Two large black blotches in the lateral line, one below origin of dorsal, the other above end of anal. Anterior margin of dorsal and upper and lower margin of caudal with a faint narrow black streak. Length 155 mm.

Differs from specimens of *H. macrolepidota* (C.V.) of equal size only by the colour and by having the dorsal spine more strongly denticulated.

Nomen indig.: Sebaro Lalas (Djambi).

Habitat: Sumatra (Palembang, Djambi!); Borneo (Pontianak).

3. Hampala bimaculata (Popta).

Barbus hampal C.V. var. *bimaculata* Popta, Notes Leyden Mus. XXV. 1904—1905, p. 173. — Ibid. XXVII. 1906, p. 147.

D. 3.8; A. 3.5; P. 1.14—16; V. 2.7—8; L. l. 25—27; L. tr. $\frac{4\frac{1}{2}}{1}$.
$\frac{}{4\frac{1}{2}}$

Elongate, profile of back slightly elevated and arched, that of head slowly descending with a shallow concavity behind eyes. Height 3.5—4.1 in length without caudal, 4.5—5.4 in length with caudal. Head 3—3.6 in length without caudal, 3.9—4.6 in length with caudal. Eye 3.8—4.9 in length of head, 1.2—1.6 in snout, 1.1—1.3 in interorbital space. Snout pointed. The upper jaw a little longer than the lower one. Cleft of mouth wide, maxillaries extending backwards to the vertical through frontborder of eye. Lips broadened: the upper one anteriorly, the lower laterally. A barbel at corner of mouth, a little longer than eye. Origin of dorsal opposite to 8th or 9th lateral scale and to origin of ventrals, in the middle of a line connecting end of snout and base of caudal, in the largest specimens a little behind that middle, separated by 10 scales from occiput. Dorsal concave, the third osseous ray feeble, and finely serrated behind, with its flexible part longer than the head without snout. Anal concave, its third spine simple, $^1/_4$ or $^1/_5$ shorter than the third dorsal one. Ventrals separated by $2^1/_2$—3 scales from lateral line, shorter than pectorals, distant from anus, in the larger specimens more distant than in the smaller ones, where they reach nearly anus. Pectorals more than half head, not reaching or reaching ventrals. Caudal deeply forked, shorter than head, as long as head or somewhat longer. Least height of caudal peduncle much less than its length, about $2^1/_2$ in head; 12 scales round caudal peduncle, 5 of which above the lateral lines. Most of the scales finely punctuated and with radiating lines. The upper side of the fish is brownish violet, on the sides of the body passing in yellow or yellowish red, the under side is yellow or yellowish red. The anterior margin

of the dorsal fin and the upper and lower margins of the caudal fin are black. Two large vertical blotches on the sides, one under the posterior half of the basis of the dorsal fin and somewhat behind it, the other on the two anterior thirds of the free part of the caudal peduncle. Is said to reach ± 500 mm. [This description was kindly made for us by Miss POPTA].

Nom. indig.: Dungan (Borneo).

Habitat: Borneo (rivers Howong, Bŏ, Kajan).

15. **Labeobarbus** Rüppell.

(RÜPPELL, Mus. Senckenberg. II. 1837, p. 14).

Elongate, moderately compressed. Snout more or less pro-

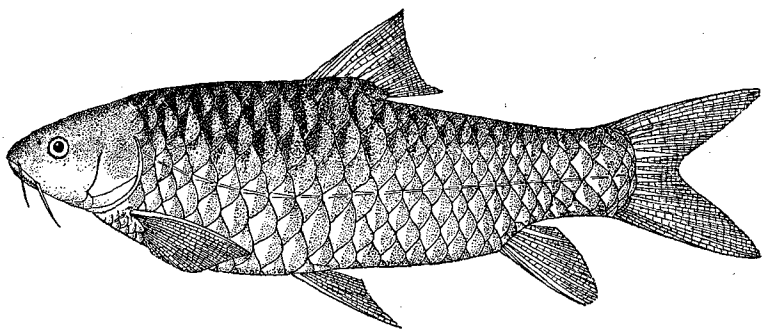

Fig. 61. *Labeobarbus tambra* (C.V.) × 1/5.

minent; mouth inferior or subinferior, horseshoe-shaped; upper jaw strongly protractile. Lips more or less thick, continuous, the lower with an uninterrupted transverse fold, the median part of which may be developed into a lobe. Four barbels: an anterior rostral pair, the other pair behind corner of mouth. Suborbital bones narrow. Dorsal with 8—9 branched rays and a scaly sheath at its base; its origin somewhat before or opposite to origin of ventrals; last osseous dorsal ray enlarged and smooth. Anal with 5 branched rays. Scales large, with fine, longitudinal or converging,

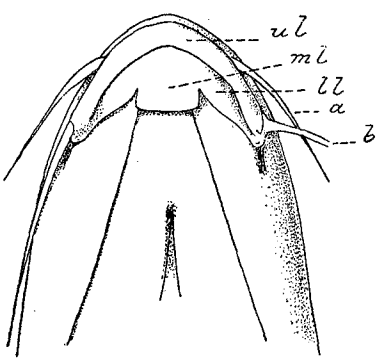

Fig. 62. Lower surface of head of *Labeobarbus tambra* (C.V.). *a* rostral, *b* maxillary barbel; *ll* lower lip with its median lobe *ml*; *ul* upper lip.

more or less undulated lines; in Indian species $3^1/_2$ longitudinal series of scales between lateral line and dorsal. Lateral line running in the middle of the tail, complete, with 21—28 scales, the tubes of which are undivided. No sensory folds on head. Gillmembranes united to isthmus, opposite to hindborder of praeoperculum. Pharyngeal teeth spoon-shaped, in three series 5.3.2—2.3.5.

Distribution: Fresh water of indo-australian Archipelago (Sumatra, Java, Borneo), of Asia and Africa.

Artificial key to the indo-australian species.

I. Lips without any lobe.
  1. Anal less high than dorsal . . . . . *L. soro* p. 148.
  2. Anal much higher than dorsal . . . . . *L. longipinnis* p. 149.

II. Lower lip with a median lobe.
  1. Median lobe reaching a line connecting corners of mouth . . . . . *L. tambroides* p. 150.
  2. Median lobe not reaching a line connecting corners of mouth.
    a. Stiff portion of osseous dorsal ray about as long as head without snout . . . . . *L. douronensis* p. 150.
    b. Stiff portion of osseous dorsal ray not quite half as long as the head. . . . . *L. tambra* p. 152.

1. Labeobarbus soro (C.V.)

Barbus soro Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 191.
Barbus soro Bleeker, Nat. Tijdschr. Ned. Indië VII. 1854, p. 90.
Labeobarbus soro Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 390. — Atl. Ichth. III. 1863, p. 79.
Barbus soro Günther, Cat. Brit. Mus. VII. 1868, p. 130.
Labeobarbus soro Vinciguerra, Ann. Mus. Civ. Genova XIV. 1879, p. 388.
Barbus soro Volz, Revue Suisse Zool. XII. 1904, p. 475.

D. 3.8—9; A. 3.5 (6); P. 1.14—16; V. 2.8; L. l. 24—28; L. tr. $\frac{3\frac{1}{2}}{3\frac{1}{2}}$.

Height 3.4—3.8, 4.3—4.6 in length with caudal. Head about 4.3, 5.4 in length with caudal. Eye about 4, about $1^1/_3$ in somewhat prominent snout and nearly twice in interorbital space. Mouth inferior. Lips moderately thick, median part of lower lip without lobe, but fixed to the skin. Rostral barbels about as long as eye or longer, shorter than maxillary ones. Length of operculum $1^1/_2$—$1^3/_4$ in its height. Origin of dorsal

nearer to snout than to base of caudal, opposite to 7th or 8th scale of lateral line, somewhat before origin of ventrals, separated by 8 or 9 scales from occiput. Dorsal concave, its third spine ossified, strong, somewhat shorter than head, without its flexible part shorter than head without snout. Anal oblique, not reaching caudal when depressed, its longest ray somewhat less than dorsal spine. Ventrals conspicuously shorter than pectorals and much shorter than height of dorsal, far distant from anus, separated by 2 scales from lateral line. Pectorals somewhat shorter than height of dorsal, far distant from ventrals. Caudal deeply incised, the lobes pointed, much longer than head. Least height of caudal peduncle $1^1/_2$ in its length, surrounded by 12 scales. Silvery, back olivaceous. Scales on upper surface with a darkish base, fins hyaline. Reaching nearly 1000 mm. according to BLEEKER.

Nomen indig.: Soro (Sundan.); Wader (Javan.); Gadis (Manindjau); Garin or Kelen gadis (Padang Pandjang).

Habitat: Sumatra (Padang, Solok, Padang Pandjang, Manindjau!, Fort de Kock!, Lake Toba!, Deli!, Benkulen); Java (Sading wetan, Darma, Garut, Surakarta, Banju biru).

This fish is kept in ponds and is in many places in Java considered to be sacred.

2. **Labeobarbus longipinnis** n.sp.

D. 3.9; A. 3.5; P. 1.14; V. 2.8; L. l. 24—25; L. tr. $\frac{3\frac{1}{2}}{3\frac{1}{2}}$.

Differs from *L. soro* by a slightly longer head, which goes 3.5—4 in length, by a lower dorsal, which goes 1.3—1.6 in head and by its third spine, which is very weak and scarcely ossified. The anal is much higher than the dorsal and reaches the caudal, when depressed. Ventrals only slightly shorter than height of dorsal. Pectorals conspicuously longer than the height of dorsal. The median fixed part of lower lip is broader than in *L. soro*. [Type of the species in the zoological Museum of Amsterdam].

Nomen indig.: Pidjen (Javan.).

Habitat: One specimen of 475 mm. from Lake Kawar! (Laut Kawar) Deli, Sumatra, Dr. L. Ph. de Bussy leg., and two specimens of 218 and 226 mm. from river Pangus on Mount Ungarang, Java!, E. Jacobson leg.

3. Labeobarbus tambroides Blkr.

Labeobarbus tambroides Bleeker, Nat. Tijdschr. Ned. Indië VII. 1854, p. 92. — Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 386. — Atl. Ichth. III. 1863, p. 77.
Barbus tambroides Günther, Cat. Brit. Mus. VII. 1868, p. 133.
Barbus tambroides Volz, Revue Suisse Zool. XII. 1904, p. 476.
Barbus tambrà Popta, Notes Leyden Mus. XXVII. 1906, p. 141 (nec C.V.).
Barbus tambroides Popta, ibid. p. 144.

D. 3.9(10); A. 3.5; P. 1.15—16; V. 2.8; L. l. 23—24; L. tr. $\frac{3\frac{1}{2}}{4\frac{1}{2}}$.

Height 3 to more than 3, 4 or somewhat more in length with caudal. Head about 3.6—3.8, 4.6—5 in length with caudal. Eye 4—5, $1^1/_2$ or more in snout, $1^1/_2$ to 2 in interorbital space. Lips broad, swollen, thick, continuous, the upper one generally with an anterior lobe, the lower one with a long free median lobe, which reaches to a line connecting the corners of the mouth. Maxillary barbels somewhat longer than the rostral ones, slightly or much longer than eye. Origin of dorsal about in the middle between end of snout and root of caudal, separated by 8 or 9 scales from occiput, opposite to 7th scale of lateral line and slightly before origin of ventrals. Dorsal concave, third spine strong, osseous, about $1^1/_5$ in head, its stiff portion as long as the head without snout. Anal truncate, depressed not reaching caudal, its height somewhat less than that of the dorsal. Ventrals as long as height of anal, not reaching anus, separated by 2 scales from lateral line. Pectorals slightly shorter than height of dorsal. Caudal deeply forked, its lobes pointed, the lower one the longer, equal to or longer than head. Least height of caudal peduncle about $1^1/_2$ times in its length, surrounded by 12 scales. Silvery, back dark, as also the fins. Length to 700 mm.

Nom. indig.: Tambra and Hampal (Sundan.); Njarem and Teklă (Bŏ); Garing or Gadji (Singkarah).

Habitat: Sumatra (Padang, Solok, Lake Singkarah!, Lake Manindjau, Pajakombo, Si-Djundjung!, Benkulen, Lahat, Upper and Lower Langkat); Java (Tjampea, Buitenzorg, Tjipanas, Banjubiru, Ngantang); Borneo (river Kapuas, river Bŏ, affluent of river Mahakam; Sarawak [British Museum].

4. Labeobarbus douronensis (C.V.).

Barbus douronensis Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 187.
Barbus douronensis Bleeker, Nat. Tijdschr. Ned. Indië VII. 1854, p. 91.

Labeobarbus douronensis Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 392. — Atl. Ichth. III. 1863, p. 79.
Barbus douronensis Günther, Cat. Brit. Mus. VII. 1868, p. 132.
Barbus douronensis Vaillant, Notes Leyden Mus. XXIV. 1902, p. 100.
Labeobarbus douronensis Fowler, Proc. Acad. Nat. Science Philadelphia (2) LVII. 1905, p. 483.
Barbus douronensis Popta, Notes Leyden Mus. XXVII. 1906, p. 142.

D. 3.9; A. 3.5; P. 1.16; V. 2.8; L. l. 21—24; L. tr. $\frac{3\frac{1}{2}}{4\frac{1}{2}}$.

Height 3.2—3.3, 4.1 in length with caudal. Head 4—4.2, 5—5.3 in length with caudal. Eye $4^1/_2$—5, $1^1/_2$ or more in snout, twice or somewhat more in interorbital space. Rostral barbels about $1^1/_2$ times, maxillary barbels about twice in eye. Lips thick, continuous, the lower one with a median, more or less developed square lobe, the hindborder of which does not reach the line connecting the corners of the mouth. The blunt snout somewhat prominent, mouth inferior. Origin of dorsal opposite to 6th or 7th scale of lateral line and slightly before that of ventrals, separated by 8 scales from occiput, somewhat nearer to end of snout than to base of caudal. Dorsal concave, its third spine osseous, rather strong, slightly shorter than head, its stiff part about equal to head without snout. Anal truncate, slightly less high than dorsal, depressed not reaching caudal. Ventrals separated by 2 scales from lateral line, their length about equal to height of anal, distant from anus. Pectorals slightly shorter than height of dorsal. Caudal deeply forked, its lobes pointed, about equal to head. Least height of caudal peduncle $1^1/_2$ or more in its length, surrounded by 12 scales. Silvery, back darkish. Base of scales of back and sides darkish. Fins hyaline. Length 350 mm.

Nom. indig.: Garing (Manindjau); Semah (Benkulen); Kantjĕra (Tjisaat and Tjandjur); Anak Sengkareng (Djember); Soro (Sundan.); Wader (Javan.); Silap (Bongan, Howong); Padak (Kajan); Njapau (Bluu).

Habitat: Sumatra (Solok!, Singkarah!, Fort de Kock!, Manindjau!, Benkulen, Telokbetong); Java (Buitenzorg, Krawang, Tjitjurup, Tjitarik, Tjandjur!, Tjisaat!, Djember!); Borneo (river Kapuas: Sintang, Raun, its affluent Howong and river Bongan, one of its sources; river Kajan, upper course of Bulongan river; river Bluu (upper Mahakam); river Baram, Sarawak).

5. **Labeobarbus tambra** (C.V.). Fig. 61, Fig. 62, p. 147].

Barbus tambra Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 190.
Labeobarbus tambra Bleeker, Nat. Tijdschr. Ned. Indië XIII, 1857, p. 476. — Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 389. — Atl. Ichth. III. 1863, p. 78.
Barbus tambra Günther, Cat. Brit. Mus. VII. 1868, p. 132.

D. 4.8—9; A. 3.5 (6); P. 1.14—16; V. 1.7—8; L. l. 22—24; L. tr. $\frac{3\frac{1}{2}}{1}$. $\frac{}{3\frac{1}{2}}$

Height $3^1/_3$—4, 4—$5^1/_5$ in length with caudal. Head pointed, 3.3—4.2, 4.1—5.3 in length with caudal. Eye 5—6.6, $1^3/_4$ to more than twice in snout and about twice in slightly convex interorbital space. Maxillary barbels generally somewhat longer than the rostral ones and about equal to length of snout. Snout prominent, mouth inferior, lips thick, continuous, the lower one with a median well developed free lobe, the hind-border of which is convex or truncate, but does not reach the line connecting the corners of the mouth. Origin of dorsal opposite to 7th scale of lateral line and slightly before that of ventrals, separated by 8 or 9 scales from occiput, nearer to end of snout than to base of caudal. Dorsal concave, its fourth ossified spine rather feeble, with its flexible portion equal to head without snout, its stiff portion less than half length of head. Anal truncate, its height somewhat more than that of dorsal, depressed reaching base of caudal or not so far. Ventrals separated by 2 scales from lateral line, their length equal to height of anal or somewhat less, distant from anus. Pectorals much longer than height of dorsal, somewhat less than length of head. Caudal deeply forked, its lobes pointed, shorter than head. Least height of caudal peduncle $1^1/_2$ in its length, more or less than twice in length of head, surrounded by 12 scales. Silvery, fins darkish. Length 650 mm., but is said to reach nearly 1000 mm.

Nom. indig.: Tambra (Sundan.); Sengkareng (Djember); Gègárĕng (Gaju); Keŭreŭténg (Atjeh).

Habitat: Sumatra (Benkulen, Solok, Padang, Lake Tawar!); Java (Darma, Garut!, Djember!, Surakarta, Banjubiru); Borneo (River Sedalit, affluent of river Sambakung, North east Borneo!). — Malacca; Penang Island.

16. Cyclocheilichthys Bleeker.

(Bleeker, Nat. Tijdschr. Ned. Indië XX. 1859—1860, p. 431).

Oblong, compressed. Snout conical, prominent. Mouth generally small, subinferior, nearly horizontal, horseshoe-shaped,

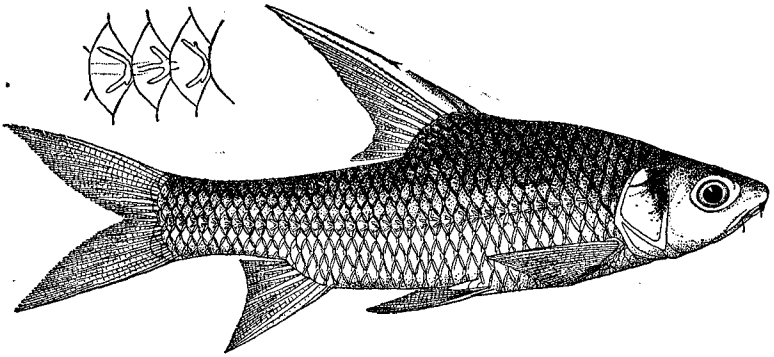

Fig. 63. *Cyclocheilichthys enoplos* (Blkr.). × 1/3.
Three scales of lateral line to show the bifid sensory tubes.

not reaching eye. Upper and lower jaw equal or the upper one overlapping the lower. The upper strongly protractile. Lips more or less swollen, sometimes rugose, continuous as also

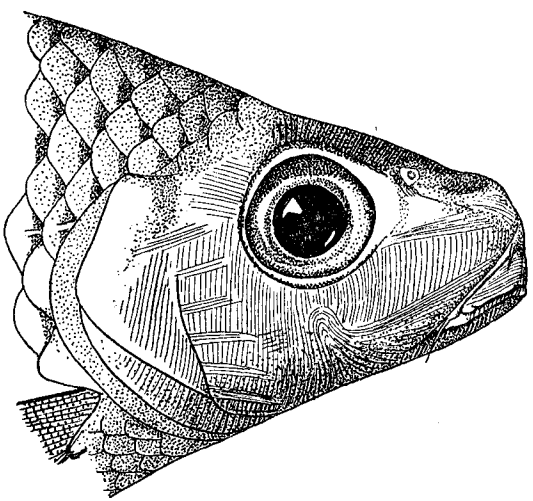

Fig. 64. Side view of head of *Cyclocheilichthys repasson* (Blkr.)
to show the numerous parallel sensory folds of the skin. Nat. size.

the postlabial groove, which runs parallel with the lips. A pair of rostral and maxillary barbels; the rostral ones or all may

be wanting. Praeorbital triangular, with its point directed forward. Suborbital bones narrow. Eye by exception with a gelatinous eyelid. Dorsal with 8 branched rays and a basal scaly sheath, its origin above or behind that of ventrals, its fourth spine strong and strongly denticulated. Anal with 5 branched rays. Scales large or moderate, longitudinally or radially striated. Lateral line complete, running in the middle of the tail, sensory tubes simple or bifid. Numerous fine parallel sensory folds on snout, extending on interorbital space and on cheeks even to operculum, skin underneath gelatinous [1]). Gillmembranes united to isthmus, opposite about hindborder of praeoperculum. Pharyngeal teeth more or less spoon-shaped, 5.3.2—2.3.5.

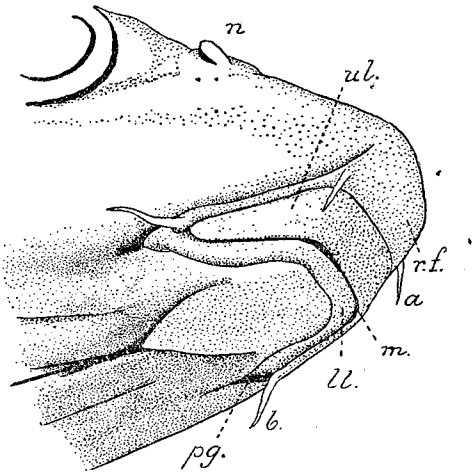

Fig. 65. Anterior part of head of *Cyclocheilichthys repasson* (Blkr.) *a* rostral, *b* maxillary barbel, *ll* lower lip, *m* mouthopening, *n* nostril, *pg* postlabial groove, which is continued to the other side behind the lower lip, *rf* rostral fold.

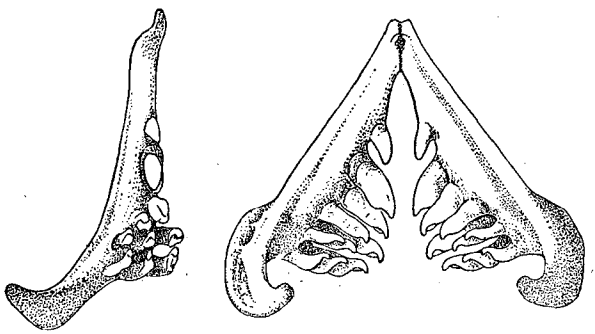

Fig. 66. Pharyngeal teeth of *Cyclocheilichthys repasson* (Blkr.) × 3.

Distribution: Fresh water of indo-australian Archipelago (Sumatra, Java, Borneo), Malacca, Tenasserim, Burma, Yunnan, Siam, Indo-China, China.

1) In alcohol specimens less distinct.

Artificial key to the indo-australian species.

I. Barbels fringed. (Subgenus *Oxybarbus*). . . . . *C. heteronema* p. 156.

II. Barbels, if present, not fringed.

A. No barbels (Subgenus *Anematichthys*).

1. Height less than three, scales generally with a dark basal spot, dark spot at base of caudal. *C. apogon* p. 156.
2. Height more than three, a narrow blackish band along lateral line, dorsal and caudal with blackish margins . . . . . *C. janthochir* p. 157.

B. Two or four barbels. (Subgenus *Cyclocheilichthys* s. str.).

1. End of tubes on scales of lateral line bifid . . *C. enoplos* p. 158.
2. End of tubes on scales of lateral line simple.

a. 4 barbels.

1) Eye 4 or more, 1.5 or more in postorbital part of head. Pectorals not reaching ventrals . . . . . *C. de Zwaani* p. 159.

2) Eye less than 4, equal to or $^1/_3$ shorter than postorbital part of head. Pectorals reaching ventrals.

α. Origin of dorsal in the middle of a line connecting snout and end of shortest caudal rays. Least height of caudal peduncle twice in length of head, surrounded by 20 scales; 4 scales between ventrals and L. l. . . . . *C. repasson* p. 160.

β. Origin of dorsal in the middle of a line connecting snout and base of caudal. Least height of caudal peduncle more than twice in head, surrounded by 16 scales; $3^1/_2$ scales between ventrals and L. l. . . . . *C. lineatus* p. 162.

b. A pair of maxillary barbels only; there may be in one case a pair of rudimentary rostral ones.

1) $5^1/_2$ scales below lateral line; P. 1.12; L. l. 34 . . . . . *C. deventeri* p. 162.

2) $6^1/_2$ scales below lateral line; P. 1.15—18; L. l. 35—37.

α. Least height of caudal peduncle less than twice in head; P. reaching ventrals. *C. armatus* p. 163.

β. Least height of caudal peduncle more than twice in head; P. not reaching ventrals . . . . . *C. siaja* p. 165.
(*C. megalops* p. 166).

1. Cyclocheilichthys heteronema (Blkr.)

Barbus heteronema Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 446.
Cyclocheilichthys (Siaja) heteronema Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 377. — Atl. Ichth. III. 1863, p. 87.
Oxybarbus heteronema Vaillant, Nouv. Arch. Mus. Hist. Nat. (3) V. 1893, p. 83.
Barbus heteronema Duncker, Mitth. Naturh. Mus. Hamburg XXI. 1904, p. 179.

D. 4.8; A. 3.5; P. 1.16; V. 1.9; L. l. 35; L. tr. $\frac{5\frac{1}{2}(6)}{1}$.
$6\frac{1}{2}$

Dorsal profile, especially from nape, strongly ascending. Height 2.8, 3.6 in length with caudal. Head about $3^1/_2$, $4^1/_2$ in length with caudal. Eye $2^1/_2$ or somewhat more, longer than snout and interorbital space and equal to postorbital space. Snout obtuse. The upper jaw overlapping the lower. A maxillary barbel above corner of mouth, divided into fringes, the longest of which are longer than the eye. Origin of dorsal opposite to 11th scale of lateral line, separated by 13 or 14 scales from occiput, slightly behind origin of ventrals, about in the middle of a line connecting end of snout and root of caudal. Dorsal concave. Fourth spine osseous, of moderate strength, strongly serrated, its stiff part nearly equal to head. Anal emarginate, depressed, far distant from caudal, its height about equal to head without snout. Ventrals subequal to pectorals, their base separated by 5 scales from 9th scale of lateral line, nearly reaching anal. Pectorals somewhat shorter than head, nearly 6 times in total length with caudal. Least height of caudal peduncle more than $1^1/_2$ in its length, somewhat more than twice in length of head, surrounded by 16 scales. Silvery, back darkish. Length 114 mm.

Habitat: Borneo (river Kapuas, river Mendalam!). — Malacca.

2. Cyclocheilichthys apogon (C.V.).

Barbus apogon Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 392.
Systomus apogon Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 428.
Systomus apogonoides Bleeker, Nat. Tijdschr. Ned. Indië IX. 1855, p. 410.
Cyclocheilichthys (Anematichthys) apogon Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 378. — Atl. Ichth. III. 1863, p. 88.
Cyclocheilichthys (Anematichthys) apogonides Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 379. — Atl. Ichth. III. 1863, p. 89.
Barbus apogon Günther, Cat. Brit. Mus. VII. 1868, p. 150.
Anematichthys apogon Jordan & Seale, Proc. U. S. Nat. Mus. XXXIII. 1908, p. 539.

D. 4.8; A. 3.5(6); P. 1.16—17; V. 2.9; L. l. 34—35; L. tr. $\frac{7}{1}$.
$\frac{}{6\frac{1}{2}}$

Upper profile ascending and slightly arched from eye to dorsal. Upper profile of head concave. Height about 2.5, 3.2—3.3 in length with caudal. Head 3.2—3.7, 4.4—4.7 in length with caudal. Eye about $3^1/_2$, less than concave interorbital space and somewhat less than snout. Skin of head gelatinous, with a multitude of parallel more or less wavy sensory lines. Lips swollen, both evenly curved. No barbels, but folds of the skin above upper lip conspicuous. Origin of dorsal opposite to 13th scale of lateral line and nearly in the middle of a line, connecting the end of the snout and the end of the shortest caudal rays, nearer to snout in young specimens, far behind origin of ventrals. Dorsal deeply concave. Total length of 4th spine somewhat shorter than head, its hindborder strongly denticulated. Anal concave, its third spine rather weak and longer than half head. Ventrals about equal to pectorals, reaching or surpassing anus, their origin separated by 4 or $4^1/_2$ scales from the 9th lateral scale. Pectorals reaching ventrals, about $^3/_4$ length of head. Caudal deeply incised, the lobes rounded, somewhat longer than head. Least height of caudal peduncle more or less than twice in length of head; surrounded by 16 scales. Scales with radiating and partly parallel lines. Yellowish brown, upper parts dark brown, each scale with a dark spot at the base. A large black spot at the end of the lateral line. Vertical fins darkish, the others more or less hyaline. Length over 200 mm.

Nom. indig.: Bebras (Palembang); Ikan bambahan (Indragiri); Lawak or Lalawak (Malay. Batavia); Gènggèhè (Situ Kamodjing); Redang, Bunghut punduk (Sundan.).

Habitat: Sumatra (Solok, brook near Singkarah!, Lake Tador, Sungei Mahe, river Kwantang, Djambi!, Deli!, Palembang!, Lahat); Java (Batavia!, Bekassi!, Buitenzorg, Sadingwetan, Lake Kamodjing near Tjihampeh!, Pandgallu, Ngawi, Surabaya, Passeruan); Borneo (Prabukarta, Sambas, Singkawang, Bengkayang, Seminis, Mandhor, river Kapuas, river Baram, Sarawak, Sandakan); Bunguran Islands; Banka. — Malacca, Tenasserim, Burma and Siam.

3. Cyclocheilichthys janthochir (Blkr.)

Systomus janthochir Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 448.

Cyclocheilichthys (*Anematicthys*) *janthochir* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 381. — Atl. Ichth. III. 1863, p. 89.
Barbus janthochir Günther, Cat. Brit. Mus. VII. 1868, p. 151.

D. 4.8—9; A. 3.5; P. 1.16—17; V. 2.9; L. l. 34—35; L. tr. $\frac{7(6\frac{1}{2})}{1}$.
$\overline{6(6\frac{1}{2})}$

Height $3^1/_2$, $4^1/_3$ in length with caudal. Head $3^2/_3$—$3^4/_5$, its upper profile straight, almost 5 in length with caudal. Eye about $3^1/_3$, about equal to interorbital space, and to somewhat pointed snout. Lower jaw received within the upper. No barbels. Origin of dorsal a little behind that of ventrals, separated by 15 scales from occiput. Dorsal emarginate, the 4th osseous ray rather slender, finely serrated and not longer than the head. Anal emarginate, its height much more than half height of dorsal. Pectorals and ventrals subequal, more than 6—$6^1/_3$ in length with caudal. Pectorals reaching to or nearly to ventrals. Ventrals not reaching anal, 4 series of scales between lateral line and root of ventrals. Caudal forked, its lobes pointed, longer than head. Least height of caudal peduncle $2^1/_4$—$2^1/_3$ in length of head. A narrow blackish band runs along the lateral line. Dorsal and caudal with blackish margins; dorsal blackish in its lower anterior part. Length over 200 mm. [A specimen from the collection of BLEEKER in the Leiden Museum seen by us].

Habitat: Borneo (river Kapuas: Pontianak!).

4. Cyclocheilichthys enoplos (Blkr.) [Fig. 63, p. 153].

Barbus enoplos Bleeker, Verh. Bat. Gen. XXIII. (1849) 1850. Ichth. Middenen Oost-Java, p. 16.
Barbus macracanthus Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 516.
Cyclocheilichthys (Cyclocheilichthys) enoplos Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 366. — Atl. Ichth. III. 1863, p. 82.
Cyclocheilichthys (Cyclocheilichthys) macracanthus Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 367. — Atl. Ichth. III. 1863, p. 83.
Barbus enoplus Günther, Cat. Brit. Mus. VII. 1868, p. 110.

D. 4.8—9; A. 3.5; P. 1.16—17; V. 2.9; L. l. 38—40; L. tr. $\frac{5\frac{1}{2}—6}{1}$.
$\overline{5\frac{1}{2}—6\frac{1}{2}}$

Oblong, compressed, profile of back arched. Height 3.2—3.6, 4.5—4.8 in length with caudal. Head pointed, about 3.5—4.2, 4.5—5.5 in length with caudal. Eye with a gelatinous membrane, which is anteriorly broader than behind, $3^1/_4$ to more than 4, shorter than snout and than interorbital space, more so in

older specimens. Maxillary barbels somewhat longer than the rostral ones, about equal to half diameter of eye. Origin of dorsal in the middle between end of snout and root of caudal, about above hindborder of 11th scale of lateral line and opposite to origin of ventrals or slightly behind it, separated by 10 scales from occiput. Dorsal concave, the anterior rays elongated, its fourth spine very strongly ossified and strongly serrated, its stiff portion longer than the head. Anal concave, its height about equal to head without snout, its simple rays rather weak. Ventrals separated by 4 scales from lateral line, somewhat longer than height of anal, slightly shorter than pectorals which reach ventrals. Caudal deeply forked, its lobes pointed, about equal to head. Least height of caudal peduncle more than twice in head, surrounded by 16 scales. Silvery, back darkish. Distal part of dorsal and caudal dark. Length 450 mm. [Specimens of *Barbus enoplos* from BLEEKER's collection in the Leiden Museum seen by us].

Nomen indig: Badjang (Djambi); Djolli (Palembang); Tjakkul, Wader (Javan.).

Habitat: Sumatra (Palembang, Djambi!); Java (Surabaya, Ngawi on Solo river). — Siam.

5. Cyclocheilichthys de Zwaani (M. Web. & de Bfrt.).

Barbus repasson Max Weber, Zool. Ergeb. Reise Niederl. Ost-Indiën, Hft. 2, 1894, p. 421 (nec Bleeker).

Barbus de Zwaani Max Weber & de Beaufort, In: Alfred Maass: Durch Zentral-Sumatra, II, 1912, p. 525.

D. 3.8; A. 3.5; P. 1.15—16; V. 2.9; L. l. 36—37; L. tr. $\frac{6}{1}$.
$\frac{}{6\frac{1}{2}}$

Compressed, dorsal profile ascending from snout to dorsal, with a slight convexity behind nape. Height 3 or somewhat more, 3.7—3.9 in length with caudal. Head 3.1—3.4, 3.7—4.3 in length with caudal. Snout slightly prominent. Eye 4—4.4, 1.2—1.5 in snout and shorter than interorbital space, 1.5—1.8 in postorbital part of head. A very short barbel behind corner of mouth and a pair of minute rostral ones. Origin of dorsal opposite to 13th scale of lateral line, in the middle of a line connecting end of snout and end of shortest caudal rays, separated by 15 scales from occiput. Dorsal concave, third spine strongly ossified and strongly denticulated, with its flexible portion 1.2—1.3 in head, 1.3—1.5 in height of body,

its stiff part about as long as head without snout. Anal slightly emarginate, about equal to head without snout or less. Origin of ventrals separated by 4 scales from 10th scale of lateral line, their length about equal to that of pectorals. Ventrals not reaching anus. Pectorals short, more than $1^1/_2$ in length of head, not reaching ventrals. Caudal deeply forked, the lobes pointed, somewhat shorter than head. Least height of caudal

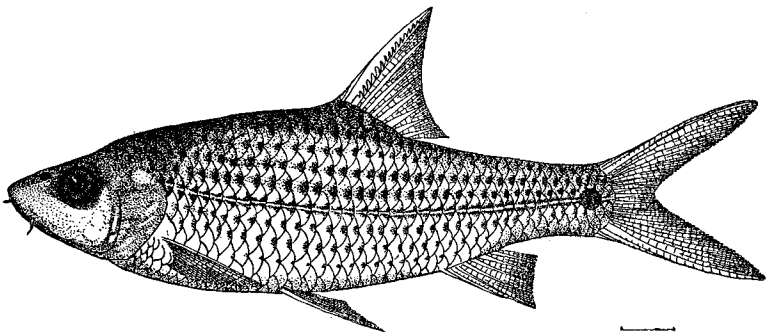

Fig. 67. *Cyclocheilichthys de Zwaani* (M. Web. & de Bfrt.) × 3/4.

peduncle nearly $2^1/_2$ in length of head and more than $1^1/_2$ in its length, surrounded by 16 scales. Silvery, back reddish brown, 6 to 8 longitudinal bands corresponding to the series of scales, the hindborder of which shows besides an oblong blackish or brownish patch. A faint blackish round patch at the end of the lateral line. Length about 210 mm. [Type of the species in the zoological Museum of Amsterdam].

Nomen indig.: Turiq (Singkarah).

Habitat: Sumatra (Solok!; Lake of Singkarah!).

6. **Cyclocheilichthys repasson** (Blkr.).

[Fig. 64, 65, 66, p. 153 and 154].

Barbus repasson Bleeker, Nat. Tijdschr. Ned. Indië IV. 1853, p. 295.

Cyclocheilichthys (Cyclocheilichthys) repasson Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 370. — Atl. Ichth. III. 1863, p. 84.

Barbus repasson Günther, Cat. Brit. Mus. VII. 1868, p. 111.

Barbus (Cyclocheilichthys) repasson Steindachner, Abh. Senckenb. Naturf. Gesellsch. XXV. 1901, p. 453.

Barbus repasson Popta, Notes Leyden Mus. XXVII. 1906, p. 128.

D. 4.8; A. 3.5; P. 1.17—18; V. 2.9; L. l. 37; L. tr. $\frac{7}{1.\frac{}{7}}$.

Compressed. Dorsal profile strongly ascending and curved from behind eyes. Height about 2.6, about 3.3 in length with

caudal. Head about 3.5, 4.1—4.4 in length with caudal. Eye 3—3$^1/_2$, shorter than flat interorbital space and shorter than snout, nearly equal to but always less than $^1/_3$ shorter than postorbital part of head. Skin of head gelatinous, with a multitude of parallel, more or less wavy sensory lines. Snout blunt, prominent. Lips swollen, the lower one mesially with a posterior curve, its frontpart with longitudinal folds. The lower jaw received within the upper. Barbels 4, small, much shorter than half eye, the posterior pair near the corner of the mouth, longer than the anterior ones; the base of both is hidden in a fold of the skin, running before upper lip to behind corner of mouth. Mouth subinferior, strongly arched. Origin of dorsal about in the middle of a line connecting end of snout with end of shortest caudal rays, opposite to 11th lateral scale, separated by 13—14 scales from occiput, situated behind origin of ventrals. Dorsal concave, total length of its fourth osseous very strong spine, the hindborder of which is roughly denticulated, together with its flexible portion about equal to head, and about 1$^1/_2$ in height of body. Anal concave, its third strong spine about equal to length of head without snout. Origin of ventrals separated by 4 scales from the 9th scale of the lateral line. Ventrals about $^2/_3$ of length of head, surpassing anus. Pectorals reaching ventrals, about $^3/_4$ length of head. Caudal deeply incised, its lobes broadly rounded, shorter than head. Scales rather thin, finely longitudinally striated with parallel lines. Least height of caudal peduncle twice in length of head and less than length of caudal peduncle, surrounded by 20 scales. Yellowish, back dark, 9 longitudinal dark bands, formed by corresponding series of black spots on the scales, the upper and lower of which are the faintest. A large black patch in the lateral line somewhat before origin of caudal. Dorsal, anal and caudal darkish, at least in their outer part, other fins hyaline or with a dark hue. Length 280 mm.

Nomen indig.: Repasson (Lampong, Sumatra); Pòjò (Samarinda).

Habitat: Sumatra (river Pangabuang (Lampong), Muarah Kompeh on river Kompeh, rivers Selapian and Ruan, river Kwantang: Taluk!, river Kampar: Gunung Sahilan!, Djambi!); Java (Sunter!); Borneo (river Kapuas: Putus Sibau!, Sebruang, river Mahakam: Samarinda!, Bunut! and its affluent Bŏ, rivers Mendalam!, Knapei and Baram). — Siam.

7. Cyclocheilichthys lineatus (Popta).

Barbus lineatus Popta, Notes Leyden Mus. XXV. 1904—1905, p. 171. — Ibid. XXVII. 1906, p. 129 (nec Duncker).
Barbus Fowlerii Popta, Notes Leyden Mus. XXVII. 1906, p. 218.

D. 3.8; A. 3.5; P. 1.17; V. 1.9; L. l. 36—37; L. tr. $\frac{6}{1}$.
$5\frac{1}{2}$

Compressed. Dorsal profile slightly ascending from snout to dorsal. Height equal to length of head, $3^{6}/_{11}$—$3^{7}/_{10}$ in length without caudal. Eye $3^{1}/_{3}$—$3^{2}/_{3}$, equal to or $^{1}/_{6}$ less than slightly convex interorbital space, and slightly shorter than bluntly pointed snout and postorbital part of head. Maxillary barbels longer than rostral ones, equal to or longer than half eye. Origin of dorsal opposite to 12th scale of lateral line, midway between end of snout and root of caudal, separated by 13 scales from the occiput. Dorsal emarginate, its height about equal to height of body, its third spine denticulated behind. Anal emarginate, beginning below 23rd scale of lateral line, its height equal to length of pectorals. Origin of ventrals separated by $3^{1}/_{2}$ scales from 11th scale of lateral line, their length equal to that of the pectorals; they dont reach to the anal. Pectorals 5 times in length of body, reaching ventrals. Caudal deeply forked, its lobes pointed, somewhat longer than head. Least height of caudal peduncle equal to $^{3}/_{7}$ of length of head, surrounded by 16 scales. Pale yellow, a broad brown longitudinal band on the sides, ending in a triangular spot at the base of the caudal. Two dark brown lines in this band, two others below it and 4 above it, a narrow dorsal median brown band from head to caudal. Dorsal and caudal with a brown hue. Length 106 mm. [Type of the species in the Leiden Museum seen by us].

Habitat: Borneo (river Bŏ, affluent of river Mahakam).

8. Cyclocheilichthys deventeri (Blkr.).

Capoëta Deventeri Bleeker, Nat. Tijdschr. Ned. Indië IX. 1855, p. 413.
Cyclocheilichthys (Siaja) Deventeri Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 375. — Atl. Ichth. III. 1863, p. 87.
Barbus deventeri Günther, Cat. Brit. Mus. VII. 1868, p. 138.

D. 4.8; A. 3.5; P. 1.12—14; V. 2.9; L. l. 34; L. tr. $\frac{6\,(5\frac{1}{2})}{1}$.
$5\frac{1}{2}$

Height 3, $3^{3}/_{4}$ in length with caudal; head $3^{3}/_{4}$, more than 5 in length with caudal. Eye about 3, about equal to interorbital space, about equal to snout. Mouth rather small, with the

upper jaw overlapping the lower. Maxillary barbels a little shorter than eye. Origin of dorsal opposite to 12th scale of lateral line, somewhat behind that of ventrals, separated by about 12 scales from occiput. Dorsal emarginate, the fourth osseous spine is of moderate strength and finely serrated, with its flexible portion somewhat longer than head. Anal emarginate, its height conspicuously less than that of dorsal. Pectorals about equal to ventrals, longer than head without snout. Four series of scales between root of ventrals and lateral line. Pectorals reaching ventrals; ventrals not reaching anal. Caudal forked, its lobes pointed, longer than head. Least height of caudal peduncle twice in length of head, 1.6 in its own length, surrounded by 12—14 scales. Colour according to BLEEKER: base of most scales of back, sides and tail with a transverse narrow brownish patch. A round blackish spot on the end of the lateral line. Length 113 mm.

Nom. indig.: Lelawah.

Habitat: Java (Lake Kamodjing near Tjihampeh!, Lake Grati).

Of this species exists one specimen of 113 mm. in a very bad state in the British Museum, described by BLEEKER and GÜNTHER, and young specimens of about 50 mm. seen by us.

9. **Cyclocheilichthys armatus** (C.V.).

Barbus armatus Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 163.
Barbus Valenciennesi Bleeker, Verh. Bat. Gen. XXIII. (1849) 1850, Ichth. Midden & Oost Java, p. 17.
Cyclocheilichthys (Cyclocheilichthys) armatus Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 368. — Atl. Ichth. III. 1863, p. 84.
Barbus armatus Günther, Cat. Brit. Mus. VII. 1868, p. 111.
Barbus armatus Popta, Notes Leyden Mus. XXVII. 1906, p. 126.

D. 4.8—9; A. 3.5; P. 1.15—16; V. 2.9; L. l. 35—36; L. tr. $\frac{6\frac{1}{2}}{1}$.
$\frac{}{6\frac{1}{2}}$

Dorsal profile of head strongly descending to the very blunt snout, that of back strongly arched. Height about 2.4, 3 in length with caudal. Head 3.4, about 4.5 in length with caudal. Eye 3.4—3.6, about equal to snout and slightly shorter than flat interorbital space, about $^1/_3$ shorter than postorbital part of head. A pair of very short barbels near corner of mouth and sometimes a rudimentary pair of rostral barbels. Origin of dorsal opposite to 10th or 11th scale of lateral line, some-

what behind the middle of a line, connecting end of snout and base of caudal, separated by 14—15 scales from occiput. Dorsal concave, 4th spine strongly ossified and strongly denticulated, with its flexible portion somewhat shorter than head and about $1^1/_2$ in height of body. Anal concave, its third spine rather strong, the length of which equals the head without snout or nearly so. Origin of ventrals separated by 4 to $4^1/_2$ scales from 9th scale of lateral line. Length of ventrals about equal to that of pectorals, equal to distance from hindborder of operculum to nostril. Ventrals reaching anus, pectorals reaching on base of ventrals. Caudal deeply forked, longer than head. Least height of caudal peduncle less than twice in length of head, somewhat less than $^4/_5$ of length of caudal peduncle, surrounded by 16 scales. Silvery, upper surface reddish brown, 7 or 8 rows of small brown spots, corresponding to the rows of scales, the upper and lower most incomplete. A large round blackish blotch at the base of the caudal. Fins more or less darkish. Length 230 mm.

Nomen indig.: Pòjò (Samarinda); Puhing (Bŏ); Lawak, Lalawak (Malay. Batavia); Wader (Javan.); Seren, Sakka (Sundan.).

Habitat: Sumatra (Lahat); ponds on Island Singkep!; Java (Batavia, Perdana, Parongkalong, river Brantas near Surabaya!); Borneo (river Kapuas: Sintang, river Mahakam: Samarinda! and river Bŏ). — Siam.

We made this description after two specimens from the Island Singkep and after one specimen from Samarinda, Borneo. We are not sure that this is the *Barbus armatus* of C.V. and of BLEEKER, as our specimens are higher. The differences in the number of scales of the l.l is of no importance, as we would find a higher number when counting the two small scales perforated by the l.l, which runs upwards along the hindborder of the operculum. Moreover BLEEKER gives for the l.l 35 in his description of *B. valenciennesi*, which he himself afterwards considered to be the same as *B. armatus*. Principally on account of the high and short caudal peduncle of our specimens, through which characteristic they differ from *B. repasson*, we bring them to *B. armatus*. Moreover there is a difference in the relative length of eye and postorbital part of head. We find only 2 barbels in the two specimens from Singkep, but we do not

think this of great importance, as GÜNTHER (l. c.) says that one of the typical specimens of BLEEKER had also only 2 barbels.

10. Cyclocheilichthys siaja Blkr.

Capoëta enoplos Bleeker, Nat. Tijdschr. Ned. Indië II. 1851, p. 431 (nec Bleeker, see p. 159).

Cyclocheilichthys (Siaja) siaja Bleeker, Act. Soc. Scient. Indo-neerl. VIII. 1860, Achtste bijdrage vischf. Sumatra, p. 52. — Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 374. — Atl. Ichth. III. 1863, p. 86.

Cyclocheilichthys (Siaja) macropus Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 373. — Atl. Ichth. III. 1863, p. 86 [1]).

Barbus siaja Günther, Cat. Brit. Mus. VII. 1868, p. 137.

D. 4.8; A. 3.5; P. 1.16—18; V. 2.9; L. l. 37; L. tr. $\frac{6\frac{1}{2}}{1}$.

Compressed, dorsal profile slightly arched. Height $3^2/_3$, $4^1/_3$ in length with caudal; head about $3^2/_3$, about $4^1/_2$ in length with caudal. Eye about 3, equal to snout and interorbital space and about equal to postorbital part of head. Upper jaw slightly overlapping the lower. A pair of very small barbels, about half eye in length, near the corner of the mouth. Origin of dorsal opposite 11th scale of lateral line, midway between end of snout and root of caudal and slightly behind origin of ventrals, separated by about 13 scales from occiput. Dorsal emarginate, fourth dorsal spine very strong, denticulated behind, its stiff portion equal to head. Anal slightly emarginate, third spine shorter than head. Pectorals and ventrals subequal, $6^1/_4$—7 in total length, not reaching ventrals. Ventrals not reaching anal, separated by 4—$4^1/_2$ scales from 10th scale of lateral line. Caudal deeply forked, lobes pointed, somewhat longer than head. Least height of caudal peduncle less than its length, more than twice in length of head, surrounded by 16 scales. Silvery, upper surface darkish. Generally a roundish blackish spot at the end of the lateral line and a humeral one. Length about 200 mm.

Nom. indig.: Siaja (Malay. Sumatra).

Habitat: Sumatra (Padang, Solok, Lakes Manindjau and Singkarah, Gunung Sahilan !); Borneo (river Kapuas: Pontianak, Sambas, Smitau). — Malacca.

1) In the Atl. Ichth. III. plate CXXXVI. (Cypr. XXXV) the figures of *Puntius schwanefeldi* and *C. macropus* are interchanged; this explains the mistake of Vinciguerra (Ann. Mus. Civ. Genova XIV. 1879, p. 389), who wrongly identified specimens of *P. schwanefeldi* as *C. macropus*.

11. Cyclocheilichthys megalops Fowl.

Cyclocheilichthys megalops Fowler, Proc. Acad. Nat. Sc. Philadelphia (2) LVII, 1905, p. 483.

„Head 3; depth 3; D. 3, 1.8; A. 3.6; P. 1.18; V. 1.9; scales 32 in lateral line to base of caudal, and 3 more on latter; 12 scales before dorsal; 7 scales obliquely back from origin of spinous dorsal to lateral line; 5 scales obliquely forward from origin of spinous anal to lateral line; width of head $2^1/_8$ in its length; depth of head, over middle of orbit, $1^4/_7$; snout $2^3/_4$; eye 3; maxillary $3^1/_2$; interorbital space $3^1/_2$; length of depressed spinous dorsal a trifle more than head; of anal $1^1/_6$; of pectoral $1^1/_3$; of ventral $1^1/_4$; least depth of caudal peduncle $2^1/_2$.

Body moderately elongate, well compressed, and greatest depth about origin of dorsal, so that back is a little elevated. Upper profile nearly straight from tip of snout to origin of dorsal. Caudal peduncle compressed, its least depth about $1^1/_8$ in its length.

Head compressed, moderately long, and upper profile horizontally oblique and straight. Snout rather long and obtuse. Eye large, longer than deep, a little anterior and high. Pupil large, vertical. Mouth inferior and terminal, upper jaw about even with tip of snout. Lips rather thin and transversely plicate. Tongue little free or distinct. Mandible inferior, not extending forward opposite tip of upper jaw. Upper jaw protractile. A small pointed maxillary barbel at corner of mouth. Nostrils adjoining, close in front of upper orbital rim. Preorbital long, about $^7/_8$ of length of horizontal orbital diameter. Interorbital space flattened, a trifle concave medianly.

Gill-opening lateral, not extending quite as far forward as posterior margin of orbit. Rakers 3 + 5, soft fleshy slender processes, much shorter than filaments, which are about equal to horizontal diameter of pupil. Isthmus broad. Scales large, arranged in parallel horizontal series, and cycloid. A row of scales along base of dorsal and anal, each forming an adnate sheath. Base of caudal scaly. A scaly pointed flap at inner base of pectoral. Head and fins with these exceptions naked. Skin of head with numerous parallel striae or plications, transverse above and vertical laterally. Lateral line of single tubes continuous, a little decurved at first till horizontal.

Origin of dorsal about opposite that of ventral, nearer base

of caudal than tip of snout, fourth ray spine-like with posterior edge becoming coarsely serrated above, and when depressed first branched ray reaches well beyond others or about $^2/_3$ of distance to base of caudal. Anal inserted about midway between origin of dorsal and base of caudal, third ray enlarged but with flexible tip, and depressed fin reaching opposite base of caudal. Caudal damaged. Pectoral low, small, and reaching back for about first fifth of length of ventral. Ventral with first branched ray longest and reaching anal.

Color in alcohol brown, lower surface paler and with traces of silvery. Each scale on back with a dusky-brown spot, regular in disposition, so that longitudinal series are formed, and several persisting even below lateral line, but lowest much paler than those above. Lower surface of head pale like abdomen. Fins same color, dorsal more or less tinted with dusky, and caudal and anal with brownish. Iris pale brassy-brown". Length 85 mm. [After FOWLER, not seen by us].

Habitat: Borneo (Baram river).

We think it probable that this species is only a young specimen of *C. siaja*. When FOWLER writes: "it agrees with BLEEKER's description of *Capoëta enoplos*, but his figure (Atlas Ichth. III. 1863, p. 82, Pl. (27) 128 fig. 2), agrees with Sumatran examples of *Cyclocheilichthys siaja*, which may be distinguished by the smaller eye, always less than a third of the length of the head", he overlooked that the quoted figure refers to *Barbus enoplos* Bleeker, which is a quite different species.

17. Lissochilus n. g.

Oblong, compressed. Snout convex, bluntly rounded, slightly

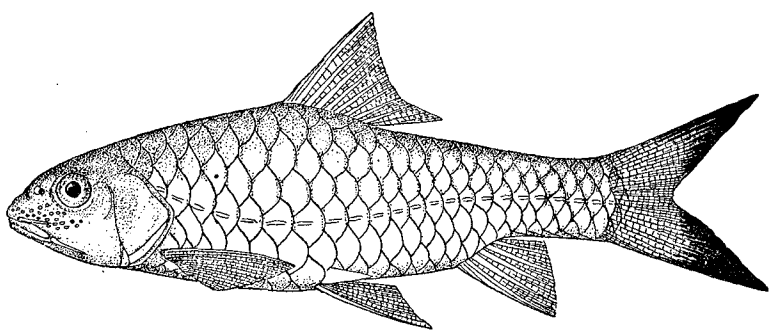

Fig. 68. *Lissochilus sumatranus* n. sp. × $^2/_3$.

prominent, laterally to below eye with series of tubercles on

pores. No lateral lobe. Anterior border of snout pendulous, entire, forming a rostral fold. Mouth moderate, semicircular, protractile; lips continuous, entire, the upper one rather thick, the lower one rather thin, mesially connected with the isthmus so that the postlabial groove is restricted to the lateral parts of the lower lip; it is distinctly separated from the lower jaw, which is covered by a horny substance, forming a sharp edge [1]). A pair of rostral and maxillary barbels. Eye with a free orbital rim. Dorsal with 9 branched rays, its last undivided ray osseous and entire, originating before ventrals. Anal short with 5 branched rays. Scales large, longitudinally striated. Lateral line running in the middle of the tail. Sensory tubes undivided. No sensory folds on head. Gillmembranes united with the isthmus. Gillrakers very short, few in number. Pharyngeal teeth in 3 series, uncinate, 5.3.2—2.3.5.

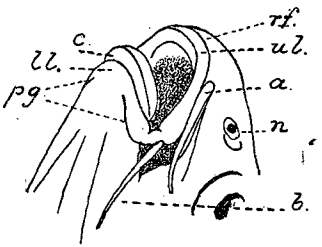

Fig. 69. Snout of *Lissochilus sumatranus* n. sp. *a.* rostral, *b.* maxillary barbel; *c.* horny covering of lower jaw; *ll.* lower lip; *n.* nostril; *pg.* postlabial groove, interrupted in the middle; *rf.* rostral fold; *ul.* upper lip.

Distribution: Mountain streams of Sumatra, Malacca, the Southern Shan States and the Himalaya range.

Key to the species.

L. l. 26—29 . . . . . *L. dukai* p. 168.
L. l. 24—25 . . . . . *L. sumatranus* p. 169.

1. **Lissochilus dukai** (Day).

Barbus Dukai Day, Fishes of India 4⁰. 1878—1888, p. 564.
Barbus soroïdes Duncker, Mitt. a. d. Naturhist. Museum Hamburg XXI. 1904, p. 178.

D. 3.9; A. 8; P. 1.14; V. 1.8; L. l. 26—29; L. tr. $\frac{3\frac{1}{2}}{4\frac{1}{2}}$.

Height 3.4—3.6, about 4.5 in length with caudal. Head about 4, less than 5 in length with caudal. Eye $3^1/_2$ to about 4, about $1^1/_2$ times in snout, which is shorter than the interorbital space. Snout somewhat prominent, barbels longer than eye. Even in young specimens the prae- and suborbital are crowded with tubercles on pores. Origin of dorsal opposite to 7th scale

1) This horny covering is not visible in formol specimens.

of lateral line, separated by 8—9 scales from occiput. Dorsal emarginate, its height equal to the distance from hindborder of operculum to nostrils, its third simple ray weakly ossified and articulated. Anal truncate, its height about equal to length of head without snout. Origin of ventrals separated by $2^1/_2$ scales from 8th scale of lateral line. Ventrals shorter than pectorals. Pectorals not quite as long as distance from hindborder of operculum to nostrils. Caudal forked, about equal to head. Least height of caudal peduncle about $1^1/_2$ times in its length, surrounded by 12 scales. Uniform grayish, yellowish white below, when young with a black patch at the base of the caudal. Length at least 160 mm. [After 2 specimens from Balassang river near Kurseong, British India].

Habitat: Sumatra [after Duncker]. — Malay Peninsula, North Eastern Bengal, Southern Shan States, rivers of Himalaya range.

2. **Lissochilus sumatranus** n.sp. [Fig. 68, 69, p. 167, 168].

D. 3—4.9; A. 3.5; P. 1.15; V. 1.8; L. l. 24—25; L. tr. $\frac{3\frac{1}{2}}{1}$.
$\frac{}{3\frac{1}{2}}$

Height 3.1—3.2, 4—4.2 in length with caudal. Head 3.4—3.7, 4.5—4.6 in length with caudal. Eye 4—4.2, nearly $1^1/_2$ in snout, which is slightly longer than interorbital space. Snout bluntly convex, prominent. Upper lip rather thick. Rostral barbel about equal to eye, maxillary one longer. Below the eye and reaching to base of rostral barbel, a rather long patch of pores, arranged in 4 irregular horizontal rows; each pore carries a horny tubercle in the centre. Origin of dorsal much nearer to snout than to end of caudal, separated by 7—8 scales from occiput and opposite to the 6th scale of lateral line. Dorsal concave, its last simple ray not strongly ossified, its height equal to the distance from hindborder of operculum to nostrils. Anal truncate, its height somewhat more than head without snout, when depressed not reaching caudal. Ventrals slightly longer than height of anal, reaching anus or not so far; their origin separated by 2 scales from the 7th scale of lateral line. Pectorals longer than height of dorsal, reaching ventrals or nearly so. Caudal nearly equal to head. Least height of caudal peduncle more than $1^1/_2$ times in its length, surrounded by 12 scales. Colour uniform, back darker; lobes of tail generally black.

Length 148 mm. [Type of the species in the zoological Museum of Amsterdam].

Habitat: Sumatra (Bandar Baru!); collected by Dr. L. PH. DE BUSSY.

18. **Puntius** Hamilton Buchanan.

(HAMILTON BUCHANAN, Fishes Ganges 1822, p. 310).

Oblong, more or less compressed. Snout generally short and obtuse, without pores or tubercles in indo-australian species. Mouth terminal or subinferior. Upper jaw more or less pro-

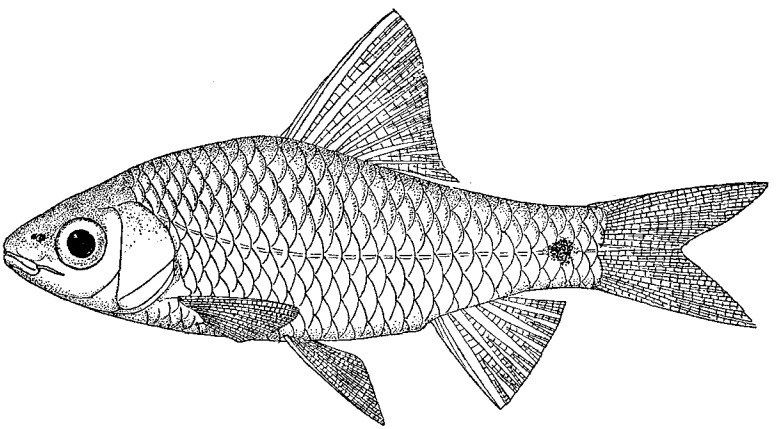

Fig. 70. *Puntius brevis* (Blkr.) × 2.

tractile. Lips generally thin, continuous. The postlabial groove which runs parallel with the lips, is interrupted in the middle of the lower jaw. Lower lip sometimes separated by a super-

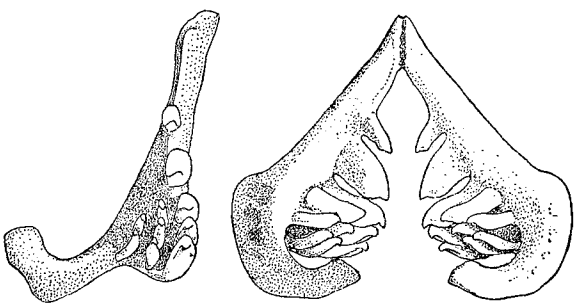

Fig. 71. *Puntius belinka* (Blkr.) Pharyngeal teeth. × 4.

ficial furrow from the lower jaw, which has no bony covering. Eyes sometimes with a narrow circular gelatinous membrane. Suborbital bones narrow. A rostral and a maxillary pair of

barbels, the rostral ones or all barbels may be wanting. Dorsal with 7—9 branched rays, with a scaly sheath at its base; its origin is opposite to that of ventrals or slightly behind it or before it. Last simple ray of dorsal generally enlarged, ossified and serrated. Anal with 5—7 branched rays, its simple rays generally ossified. Scales large or moderate, smooth or with longitudinal radiating lines of different character. Lateral line complete or incomplete, running in or nearly in the middle of the tail, with 17—38 scales. Sensory tubes undivided. No sensory folds on head. Gillmembranes united to isthmus, opposite to hindborder of eye or praeoperculum. Pharyngeal teeth 5 or 4. 4 or 3. 3,2 or 1—3, 2 or 1. 4 or 3. 5 or 4.

Distribution: Indo-australian Archipelago (from Sumatra to Borneo and Lombok). Philippines. Temperate and tropical parts of Asia and Africa.

Artificial key to the indo-australian species of Puntius.

I. Linea lateralis incomplete, no rostral barbels.

a. Linea lateralis with 17 (19) scales. Caudal peduncle surrounded by 8 scales . . . . . *P. oligolepis* p. 173.

b. Linea lateralis with 23 scales. Caudal peduncle surrounded by 12 scales. . . . . *P. sumatranus* p. 191.

II. Linea lateralis complete.

a. Last simple dorsal ray not ossified . . . . . *P. aphya* p. 175.

b. Last simple dorsal ray osseous.

1. Osseous dorsal ray smooth . . . . . *P. brevis* p. 176.

2. Osseous dorsal ray denticulated behind.

A. Four barbels. Anal spines rather weak.

1. 8—9 scales between L. l. and dorsal; L. l. 35—36.

a. 9 scales between L. l. and dorsal. Origin of dorsal opposite to 13th scale and separated by 16 scales from occiput . . . . . *P. belinka* p. 177.

b. 8 scales between L. l. and dorsal. Origin of dorsal opposite to 11th scale and separated by 13 scales from occiput . . . . . *P. schwanefeldi* p. 178.

2. 7 or less scales between L. l. and dorsal. L. l. by exception 34, generally less.

A. 12 scales round caudal peduncle.

(*a*). With more or less complete transverse dark bands.

1. 2—2 1/2 scales between L. l. and ventrals.
   a. L. tr. $\frac{4\frac{1}{2}}{1}$. Two anterior transverse and a posterior longitudinal band $\frac{3\frac{1}{2}}{}$ . . . . . *P. lateristriga* p. 179.
   b. L. tr. $\frac{3\frac{1}{2}}{1}$. A transverse bar across nape, an anterior longitudinal band $\frac{4\frac{1}{2}}{}$ and 5 spots on each side. . . . . *P. everetti* p. 180.
2. 3—3 1/2 scales between L. l. and ventrals.
   a. 6 transverse bands, the first through eye. 5 1/2 scales between L. l. and dorsal . . . . . *P. hexazona* p. 181.
   b. 5 transverse bands on body only. 5 1/2 (6) scales between lateral line and dorsal . . . . *P. pentazona* p. 182.
   c. 4 transverse bands on body only; 4 1/2 scales between L. l. and dorsal. . . . . *P. tetrazona* p. 183.

(*b*). With longitudinal bands; 3—4 scales between L.l. and ventrals. . . . . *P. fasciatus* p. 184.

(*c*). No transverse bands, a single lateral band may be present, there may be spots.
   a. Height of caudal peduncle 2 1/2 times in head; 1 1/2 times in its length; eye 5 . . . . . *P. tawarensis* p. 185.
   b. Height of caudal peduncle ± 2 times in head, more than 1 1/2 times in its length; eye 4.6—5. *P. microps* p. 186.
   c. Height of caudal peduncle 1 1/2—2 times in head, equal to its own length or 1/3 shorter; eye 3.3—4.5. . . . . *P. binotatus* p. 186.

B. 14—18 scales round caudal peduncle.

(*a*). Height 1 3/4 in length . . . . . *P. platysoma* p. 189.

(*b*). Height more than 2 in length.
   1. L. l. 23. . . . . *P. anchisporus* p. 190.
   2. L. l. 27—34.
      a. 4 lateral black blotches. . . . . *P. elongatus* p. 191.
      b. Without lateral blotches.
         a. Anal rays 3.5.
            a). Caudal peduncle surrounded by 14 scales.
               a. L. tr. $\frac{6}{1}$. Seven blackish longitudinal $\frac{}{4}$ streaks on the body. . . . . *P. strigatus* p. 192.
               b. L.tr. $\frac{5\frac{1}{2}—6}{1}$. No longitudinal streaks. *P. huguenini* p. 193. $\frac{}{5—5\frac{1}{2}}$
            b). Caudal peduncle surrounded by 16 scales.

a. Dorsal spine with its flexible part somewhat shorter than head, finely serrated, with about 30 serratures. *P. orphoides* p. 193.

b. Dorsal spine with its flexible part equal to but usually longer than head, coarsely serrated; with about 20 serratures.

1. Least height of caudal peduncle $1^1/_3$—$1^1/_2$ in length of head. Ventrals separated by $3^1/_2$ scales from L. l. . . . . *P. bramoides* p. 195.
2. Least height of caudal peduncle 1.7—2 in head. Ventrals separated by $2^1/_2$ scales from L. l. . . . . *P. collingwoodi* p. 196.

β. Anal rays 3.6.

a. Barbels minute; $5^1/_2$ scales below lateral line, 3—$3^1/_2$ between it and origin of ventrals . . . . . *P. javanicus* p. 197.

b. Barbels longer than eye; $4^1/_2$ scales below lateral line, $2^1/_2$ between it and origin of ventrals. . . . . *P. sunieri* p. 199.

B. No barbels. Anal spines strongly ossified.

1. Anal 3.5.
   a. Caudal peduncle surrounded by 16 scales, 7 scales between L. l. and D., $4^1/_2$ between V. and L. l. *P. bulu* p. 199.
   b. Caudal peduncle surrounded by 18—20 scales, 9 scales between L. l. and D., 5—6 between V. and L.l. *P. waandersi* p. 200.
2. Anal 3.6. Caudal peduncle surrounded by 20 scales, 9 scales between L.l. and D., 5—$5^1/_2$ between V. and L.l. *P. nini* p. 202.
3. Anal 3.7. Caudal peduncle surrounded by 16 scales; 8 scales between L.l. and D., 4 between L.l. and V. *P. lawak* p. 203.

Doubtful species.

P. amblyrhynchus p. 204.
P. bunter p. 204.
P. carassioides p. 204.
P. vittatus p. 205.

1. Puntius oligolepis (Blkr.).

Capoëta oligolepis Bleeker, Nat. Tijdschr. Ned. Indië IV. 1853, p. 296.
Systomus (Capoëta) oligolepis Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 357.

Puntius (Capoëta) oligolepis Bleeker, Atl. Ichth. III. 1863, p. 109.
Barbus oligolepis Günther, Cat. Brit. Mus. VII. 1868, p. 147.
Puntius (Capoeta) oligolepis Vinciguerra, Ann. Mus. Civ. Genova XIV. 1879, p. 396.
Barbus oligolepis Max Weber, Zool. Ergebn. Reise Niederl. Ost-Ind., 1894, p. 423.

D. 4.8; A. 3.5; P. 1.12; V. 1.7—8; L. l. 17 (and 2—4 on caudal); L. tr. $\frac{3\frac{1}{2}}{1}$.
$\frac{}{3\frac{1}{2}}$

Oblong, dorsal profile slightly arched. Height 2.7—2.9, 3.4—3.7 in length with caudal. Head 3.2, 4—4.2 in length with caudal. Eye 2.6—2.8, about equal to snout and interorbital space. Snout blunt, slightly prominent above semicircular mouth. Lips continuous. A barbel at the corner of the mouth, shorter than eye. Origin of dorsal opposite to 7th or 8th scale of lateral line and about opposite to ventrals; in the middle between end of snout and root of caudal; separated by 8 scales from occiput. Dorsal truncate, none of the rays osseous, about $^3/_4$ length of head. Anal truncate, its height

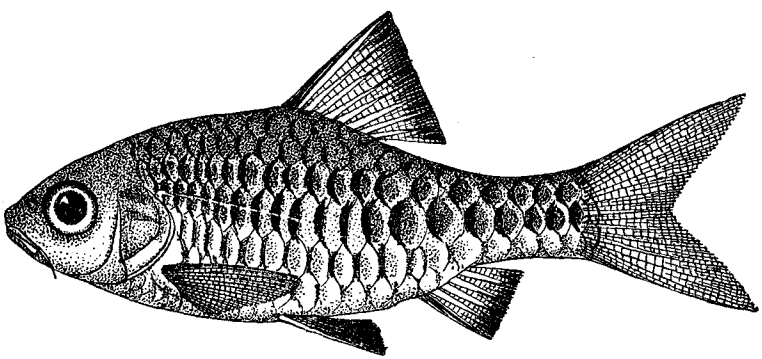

Fig. 72. *Puntius oligolepis* (Blkr.) × 3.

about half length of head. Ventrals and pectorals subequal, ventrals reaching anus. Pectorals $^3/_4$ length of head. Caudal bifurcate, shorter than or equal to head. Least height of caudal peduncle twice in head, $1^1/_2$ in its own length, surrounded by 8 scales. Scales with radiating longitudinal lines. Linea lateralis incomplete, only the 6 or 7 first scales being perforated. Silvery, upper surface brownish, base of scale-pouches dark brown, giving the fish a reticulate appearance. There may be a black patch at base of caudal. Fins powdered with brown, anterior and upper margin of dorsal and anal and greater part of ventrals and pectorals deep brown. Length 47 mm.

Habitat: Sumatra (Priaman, Lake Manindjau, Kaju Tanam!, Ajer Mantjur, Pajakombo!). — In brooks, lakes and rivers.

2. Puntius aphya (Gthr.).

Gnathopogon javanicus Bleeker, Atl. Ichth. III. 1863, p. 117. Ned. Tijdschr. Dierk. II. 1865, p. 137.

Barbus aphya Günther, Cat. Brit. Mus. VII. 1868, p. 137.

D. 2.7; A. 2.6; P. 1.13 [1]); V. 2.6; L. l. 35; L. tr. $\frac{4\frac{1}{2}}{1}$.
$\frac{}{4\frac{1}{2}}$

Elongate, compressed. Dorsal profile from snout to dorsal somewhat convex. Height $4^1/_2$. Head $3^3/_4$ in length without caudal. Eye less than 4, with a circular membrane, slightly longer than snout. Interorbital space convex, a little more than diameter of eye. Snout acutely convex. Praeorbital pentagon, anterior inferior and lower posterior border straight, upper borders strongly concave, longer than the inferior borders, both united in an acute angle, looking towards the nostrils. Jaws even anteriorly, maxillary reaching to the vertical from the orbit. Lips slender. Two maxillary barbels, shorter than eye. Origin of dorsal somewhat in advance of the ventrals and nearly midway between the end of the snout and the root of the caudal. Dorsal scarcely emarginate, its height not much less than that of the body. Second simple ray slender, not osseous, flexible. Anal scarcely emarginate, lower than dorsal. Simple rays not osseous and very slender. Ventrals and pectorals subequal, about $7^1/_2$ times in length, slightly longer than post-orbital part of head. Ventrals not reaching anal, separated by $2^1/_2$ series of scales from lateral line. Pectorals ending at some distance from the ventrals. Caudal deeply incised, its lobes acute, about $4^2/_3$ in length [after BLEEKER] [2]). Least height of caudal peduncle a little more than twice in head and 1.4 in its own length. Free part of scales longitudinally and somewhat radially striated. Lateral line straight, the tubes simple, reaching the free border of the scales or nearly so. Colour in spirits brown with a distinct silvery band from head to caudal, broadest posteriorly. Length of single specimen known 61 mm.

Habitat: Java!

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1) In the description of BLEEKER in Atlas Ichthyologique l. c. the number of the pectoral rays is erroneously given as 1.17.

2) In the only available specimen the caudal is wanting.

As there is some discrepancy in the description of BLEEKER and GÜNTHER of the single known specimen, preserved in the British Museum, we draw attention to the fact that the above description is made after reexamination of the type by us.

3. **Puntius brevis** (Blkr.) [Fig. 70, pag. 171].

Capoëta brevis Bleeker, Verh. Bat. Gen. XXIII. (1849) 1850, Ichth. Midden- en Oost-Java, p. 21.
Capoëta javanica Bleeker, Nat. Tijdschr. Ned. Indië IX. 1855, p. 412.
Systomus (Capoëta) brevis Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 355.
Systomus (Capoëta) leiacanthus Bleeker, Ichth. Arch. Ind. Podr. II. Cyprini, 1860, p. 356.
Puntius (Capoëta) brevis Bleeker, Atl. Ichth. III. 1863, p. 108.
Puntius (Capoëta) leiacanthus Bleeker, Atl. Ichth. III. 1863, p. 109.
Barbus liacanthus Günther, Cat. Brit. Mus. VII. 1868, p. 141 (pro parte).
Barbus brevis Günther, Cat. Brit. Mus. VII. 1868, p. 145.

D. 3.8; A. 3.5; P. 1.11—14; V. 1.8—9; L. l. 23—26; L. tr. $\frac{4\frac{1}{2}(5)}{1}$.

Compressed, dorsal profile from snout to dorsal ascending, slightly convex, with a concavity above the nape. Height 2.7—2.8, head 3.6 to about 4. Eye more or less than 3, about $^1/_3$ longer than snout and slightly less than the somewhat flattened interorbital space. Mouth nearly terminal, strongly arched, jaws equal. A maxillary barbel at the corner of the mouth, shorter than the eye. Origin of dorsal opposite to 8th scale of lateral line and to that of ventrals, before the middle of a line connecting end of snout and base of caudal, separated by 9 scales from occiput. Dorsal concave, the third osseous ray of moderate strength and smooth behind, with its flexible portion about equal to length of head. Anal emarginate, the third simple ray only osseous at the base, its height equal to about half head. Ventrals and pectorals subequal, about equal to head without snout. Ventrals separated by $2^1/_2$—3 scales from lateral line; their end far distant from anus or reaching it. Pectorals nearly reaching ventrals or not so far. Caudal deeply incised, its lobes pointed. Least height of caudal peduncle more than $1^1/_2$ times in length of head, somewhat shorter than its own length, surrounded by 12 scales. Scales with 2 to 4 radiating lines, in some scales more numerous and anastomising. Silvery, back darkish. With or without a more or less distinct black spot at the end of the lateral line

(*P. leiacanthus* Blkr.), if it is wanting there may be a silvery band along the sides. Length 90 mm.

Nom. indig.: Tjahul (Tulung Agung); Lukas, Wader (Javan.).

Habitat: Java (Buitenzorg, Tulung Agung!, Pasuruan, Grati, Surabaya, Gombong, Palabuan). — Siam.

In rivers, lakes and marshes.

4. **Puntius belinka** (Blkr.) [Fig. 71, p. 171].

Systomus (Barbodes) belinka Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 321.

Puntius (Barbodes) belinka Bleeker, Atl. Ichth. III. 1863, p. 93.

Barbus schwanefeldi Günther, Cat. Brit. Mus. VII. 1868, p. 112 (p. p.).

Barbus (Puntius) belinka Max Weber & de Beaufort, In Maass: "Durch Zentral Sumatra" II. 1912, Fische p. 526.

D. 4.8; A. 3.5 (6); P. 1.14—16; V. 2.8; L. l. 36; L. tr. $\frac{9}{1}$. $\frac{}{6\frac{1}{2}}$

Profile strongly arched from snout to dorsal. Height 2.3—2.4, 3.1 in length with caudal. Head 4.1—4.3, 5.4—5.8 in length with caudal. Eye 3.6, about equal to snout and somewhat more in postorbital part of head. Mouth terminal; four barbels, equal to or somewhat longer than eye. Origin of dorsal opposite to 13th scale of lateral line and slightly before middle of line connecting end of snout and last scales on tail, separated by 16 scales from occiput. Dorsal deeply emarginate, the last ray prolonged. Fourth dorsal spine rather strong, coarsely denticulated behind, with its stiff portion somewhat shorter than head, nearly twice in height. Anal emarginate, height of third spine more than $1^1/_2$ in head. Origin of ventrals separated by 4 scales from 11th scale of lateral line, somewhat shorter than pectorals, not reaching anus. Pectorals equal to distance from hindborder of operculum to nostrils, far distant from base of ventrals. Caudal deeply forked, its lobes pointed, much longer than head. Least height of caudal peduncle 1.2—1.3 in its length, about $1^2/_3$ in head, surrounded by 16 scales. Scales without longitudinal lines. Silvery, back dark, in formol specimens with faint longitudinal lines, corresponding to the rows of scales. Posterior part of dorsal darkish. Caudal lobes with an intramarginal black band. Length 235 mm.

Habitat: Sumatra (Padang, Solok!, lake Singkarah). — Malacca.

5. Puntius schwanefeldi (Blkr.).

Barbus Schwanefeldii Bleeker, Nat. Tijdschr. Ned. Indië, V, 1853, p. 517.
Systomus (Barbodes) Schwanefeldi Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 323.
Puntius (Barbodes) Schwanefeldi Bleeker, Atl. Ichth. III. 1863, p. 94.
Barbus schwanefeldi Günther, Cat. Brit. Mus. VII. 1868, p. 112 (pro parte).
Cyclocheilichthys (Siaja) macropus Vinciguerra, Ann. Mus. Civ. Genova XIV. 1879, p. 389 (nec Bleeker).
Barbus schwanefeldii Max Weber, Zool. Ergebn. Reise Niederl. Ost Indien, Heft 2, 1894, p. 421.
Barbus (Barbodes) schwanefeldi Steindachner, Abh. Senckenb. Naturf. Gesellsch. XXV. 1901, p. 453.
Barbus Schwanefeldi Vaillant, Notes Leyden Museum XXIV. 1902, p. 94.
Barbus Schwanefeldi, var. *rubra* Vaillant, l. c. p. 95.
Barbus schwanefeldi Volz, Revue Suisse Zool. XII. 1904, p. 474.
Puntius Schwanefeldii Fowler, Proc. Acad. Nat. Science Philadelphia (2) LVII. 1905, p. 485.

D. 3.8; A. 3.5 (6); P. 1.14—15; V. 2.8; L. l. 35—36; L. tr. $\frac{8}{6}$.

Profile strongly arched from snout to dorsal. Compressed. Height 2.3—2.4, 3 or less in length with caudal. Head 3.5—4, 5 in length with caudal. Eye 3—3.7, somewhat shorter than snout, longer than snout in smaller specimens. Snout bluntly pointed, upper jaw slightly prominent. Lips rather thin. Four barbels, the rostral ones shorter than those at the corner of the mouth, which are much longer than eye. Origin of dorsal about opposite to 11th scale of lateral line and to middle of line connecting end of snout and root of caudal, separated by 13 scales from occiput. Dorsal concave, third dorsal spine very strong, with strong teeth posteriorly, nearly equal to head or somewhat shorter (with its flexible part). Anal deeply concave, its strong smooth third spine shorter than the dorsal one. Ventrals about equal to pectorals, their origin separated by 3 or $3\frac{1}{2}$ (4) scales from 9th scale of lateral line, surpassing anus. Pectorals somewhat shorter than head, reaching to or surpassing base of ventrals, in old specimens as long as head and not reaching ventrals. Caudal deeply forked, its lobes pointed, much longer than head. Least height of caudal peduncle equal to its length, about $1\frac{2}{3}$ in head, or less in old specimens, surrounded by 16 scales. Scales with more or less parallel conspicuous longitudinal lines. Silvery, upper surface greyish brown in alcohol specimens, sides and lower surface whitish. Fins hyaline. Upper part of dorsal blackish, pectorals dark.

A blackish longitudinal intramarginal band runs along each lobe of the caudal. Length 340 mm.

Nom. indig.: Lampan (Lampong, Sumatra); Kepiat (Djambi); Tenadak mera, Lĕmpèm or Lampam (Mahakam).

Habitat: Sumatra (Padang, Solok, Lake Singkarah!, Padang Pandjang, Pajakombo, Lake Manindjau, river Kwantan or Indragiri: Si-Djungdjung!, Taluk!, Ringat!, river Kampar: Gunung Sahilan!, river Lamatang ilir: Benekat, Upper Langkat, Djambi!, river Musi: Palembang, river Kompeh: Muara Kompeh, river Pangabuang (Lampong), river Uler, Serdang); Borneo (river Kapuas: Pontianak, Kota Bangun!, Bunut! and its upper course, river Baram, Lake Danau Sriang, river Mahakam: Samarinda!, Batu Pangal!). — Malacca, Siam.

6. **Puntius lateristriga** (C. V.).

Barbus lateristriga Cuvier & Valenciennes, Hist. Nat. Poissons, XVI. 1842, p. 161.
Barbus lateristriga Bleeker, Nat. Tijdschr. Ned. Indië III. (1851) 1852, p. 95.
Systomus (Barbodes) lateristriga Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 342. — Atl. Ichth. III. 1863, p. 102.
Barbus lateristriga Günther, Cat. Brit. Mus. VII. 1868, p. 125.
Barbus lateristriga Steindachner, Ichth. Notizen, Sitzber. Akad. Wien, LXI. 1. Abth. 1870, p. 632.
Barbus lateristriga Volz, Zool. Jahrb. Abth. System. XIX. 1903, p. 399.

D. 4.8; A. 3.5; P. 1.14—15; V. 1.8; L. l. 23; L. tr. $\frac{4\frac{1}{2}}{1}$.
$\frac{}{3\frac{1}{2}}$

Oblong, compressed, somewhat elevated. Dorsal profile ascending with a slight convexity behind the nape. Height 2.4—2.5, 3—3.1 in length with caudal. Head 3.7, 4.5—4.8 in length with caudal. Eye about 4, situated close to the upper profile of the head, much shorter than obtuse snout, $1\frac{1}{2}$ in flat interorbital space. Snout obtuse, mouth nearly terminal. Rostral barbels nearly equal to eye, maxillary ones conspicuously longer. Origin of dorsal opposite to that of ventrals, opposite to 7th or 8th scale of lateral line, separated by 8 scales from occiput, about in the middle between end of snout and base of caudal. Dorsal nearly truncate, the fourth osseous spine rather strong, with fine and crowded serrae; in adult specimens more than half as long as head, in younger ones longer than head without snout. Anal slightly emarginate, longest rays equal to half head, longer in young specimens. Ventrals and pectorals subequal. Ventrals separated by 2—$2\frac{1}{2}$ scales from lateral line, not reaching anus. Pectorals about $\frac{2}{3}$ of head,

not reaching ventrals. Caudal emarginate, lobes rounded, shorter than or about equal to head. Least height of caudal peduncle 1.8 to nearly twice in head, much less than its own length, surrounded by 12 scales. Scales with longitudinally radiating striae. Silvery, upper surface brownish, a triangular black blotch on the top of the head. A broad band descending from back to pectorals, a second tapering one descending from base of dorsal to ventrals; a longitudinal black band along the middle of the tail. There may be an anterior longitudinal band between the two crossbands. Often a black spot above base of anal. Length 180 mm.

Nomen indig.: Dokkum (Sundan.).

Habitat: Sumatra (Sungei Putih near Serdang!, Air Runding in Padangsche Benedenlanden!, Ravin of Arau!, Si-Djundjung!, Solok, Lahat, Benkulen, Telok Betong, river Semangus, affluent of river Musi, Sungei Sunkaka, Sungei Mahe, Upper Langkat, Deli); Singapore; Java (Batavia, Buitenzorg, Tjampea, Sadingwetan, Tjipanas); Borneo (Bangkajang, Seminis, Lumar, Danau Sriang, Senah); Banka; Biliton; Singkep!. — Malacca.

7. **Puntius everetti** (Blgr.).

Barbus Everetti Boulenger, Ann. Mag. Nat. Hist. (6) XIII. 1894, p. 248.

D. 4.8; A. 3.5; P. 1.13; V. 1.7; L. l. 22—25; L. tr. $\frac{3\frac{1}{2}}{4\frac{1}{2}}$.

Height 2.1, 3.7 in length with caudal; head 3.7, 4.7 in length with caudal. Eye 4.2, 1.6 in interorbital space, 1.4 in snout, which is rounded and not prominent. Rostral barbels $1^2/_3$ to twice as long as diameter of eye, a little shorter than maxillary barbels. Origin of dorsal opposite to that of ventrals and to 8th scale of lateral line, separated by 9 scales from occiput. Fourth dorsal spine rather feeble, with 17—22 serrae, its stiff portion about half length of head, with its flexible portion about equal to head without snout. Height of anal a little more than half length of head. Ventrals slightly shorter than pectorals; separated by 2 scales from 8th scale of lateral line. Pectorals longer than head without snout. Caudal forked, about equal to length of head. Least height of caudal peduncle 1.7 in head, 1.2 in its own length, surrounded by 12 scales. Brown above, yellowish beneath; a black bar across the nape, a short longitudinal black streak on each side of the anterior

part of the body. Five round black spots on each side, two above the lateral line and two below it above the ventral and anal, which may be united to not well marked crossbars. The fifth spot on the lateral line a little in front of the base of the caudal; dorsal and anal tipped with blackish. Total length 100 mm. [Type of the species in the British Museum seen by us].

Habitat: Singapore; Poeh, Sarawak (Borneo); Bunguran Island.

Note. This species is near to *Puntius tetrazona* (Blkr.), from which it chiefly differs by the number of scales of the linea transversalis and by only 2 scales instead of 3 between origin of ventrals and lateral line. It has also some affinity to *P. lateristriga* (C.V.). It may be possible that it is a hybrid between the lastnamed species and *P. tetrazona* (Blkr.).

8. **Puntius hexazona** (M. Web. & de Bfrt.).

Barbus (Barbodes) hexazona Max Weber & de Beaufort, In Alfr. Maass: Durch Zentral-Sumatra, II. 1912, Fische, p. 527.

D. 4.8; A. 3.5; P. 1.14; V. 1.8; L. l. 23—25; L. tr. $\frac{5\frac{1}{2}}{1}$.
$\frac{}{4\frac{1}{2}}$

Oblong, dorsal profile strongly arched, with a slight concavity above the nape. Height 2.3—2.4, 3 or somewhat more in length with caudal. Head 3.2—3.4, 4.3—4.4 in length with

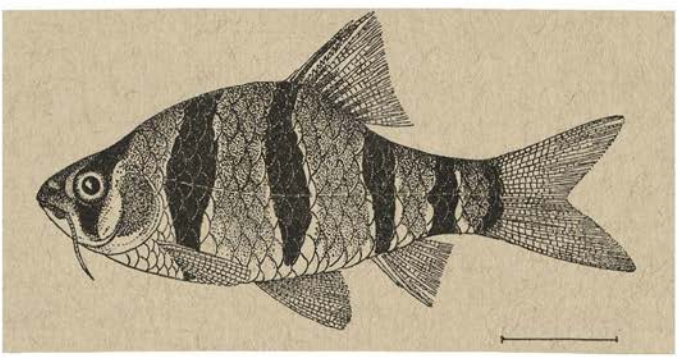


Fig. 73. *Puntius hexazona* (M. Web. & de Bfrt.) × 1½.

caudal. Eye about 3, about equal to snout and interorbital space. Barbels longer than eye. Origin of dorsal opposite to 8th or 9th scale of lateral line, somewhat behind origin of ventrals, in the middle of a line connecting end of snout and base of caudal, separated by 9 scales from occiput. Dorsal

truncate, fourth osseous spine rather strong, with about 20 serrae, with its flexible part somewhat longer than head without snout. Anal truncate, its height shorter than head without snout. Ventrals and pectorals subequal. Ventrals reaching anus, separated by 3—$3^1/_2$ scales from lateral line. Pectorals nearly equal to head without snout. Caudal deeply emarginate, the lobes rounded, about equal to length of head. Least height of caudal peduncle about $1^1/_2$ in head, somewhat shorter than its own length, surrounded by 12 scales. Scales faintly striated. Colour of formol specimens dark red, lighter towards belly. Six black light-margined transverse bands, the first through eye, bent backwards and uniting on the nape with that of the other side, the second behind pectorals from back to belly, the third from origin of dorsal to ventrals, the fourth behind dorsal to beginning of anal, the fifth in the middle of the caudal peduncle, the sixth at the base of caudal. Ventrals with traces of orange-red. Length 55 mm. [Type of the species in the zoological Museum of Amsterdam].

Nom. indig.: Ikan kadis (Djambi).

Habitat: Sumatra (Djambi!, Bagan api api!, Taluk!, Lalak on river Indragiri!).

Note: This species may be only a colour-variety of *P. pentazona* (Blgr.).

9. **Puntius pentazona** (Blgr.).

Barbus pentazona Boulenger, Ann. Mag. Nat. Hist. (6) XIII. 1894, p. 248.
Barbus (Barbodes) pentazona Steindachner, Abh. Senckenb. Naturf. Gesellsch. XXV. 1901, p. 454.

D. 3.8; A. 3.5; L. l. 22—25; L. tr. $\frac{5\frac{1}{2}\,(6)}{1\quad\quad}$.
$\quad\quad\quad

the fourth and fifth on the caudal peduncle. These bands may have a brownish-yellow margin. Base of dorsal or part of it blackish. Length 51 mm. [After BOULENGER and STEINDACHNER, not seen by us].

Habitat: Singapore [British Museum]; Borneo (Baram river, Akar river [British Museum]). — Malay Peninsula [British Museum].

10. **Puntius tetrazona** (Blkr.).

Barbus tetrazona Bleeker, Act. Soc. Scient. Indo-Neerl. II. 1857. Tiende Bijdr. Ichth. Borneo p. 14.

Systomus (Barbodes) tetrazona Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 341.

Puntius (Barbodes) tetrazona Bleeker, Atl. Ichth. III. 1863, p. 102.

Barbus tetrazona Günther, Cat. Brit. Mus. VII. 1868, p. 124.

D. 4.8; A. 3.5; P. 1.14; V. 1.8; L. l. 24—25; L. tr. $\frac{4\frac{1}{2}}{1}$.
$\frac{}{4\frac{1}{2}}$

Compressed, dorsal profile arched from snout to dorsal. Height 2.8, 3.1 in length with caudal. Head 3.5, 4.7 in length with caudal. Eye 3.8, slightly shorter than snout and interorbital space. Snout obtuse, slightly prominent, rostral barbels shorter than maxillary ones, which are nearly twice eye. Origin of dorsal opposite to 8th scale of lateral line and to origin of ventrals, nearly opposite to the middle of a line connecting end of snout and base of caudal, separated by 9 scales from occiput. Dorsal nearly truncate, fourth osseous spine of moderate strength and finely serrated behind, with its flexible portion equal to head without snout. Anal truncate, its longest rays half length of dorsal. Pectorals and ventrals equal, slightly shorter than head. Ventrals reaching anus, outer prolonged ray reaching anal; separated by 3 scales from lateral line. Outer ray of pectorals prolonged, reaching on ventrals. Caudal deeply emarginate, lobes somewhat pointed, shorter than head. Least height of caudal peduncle nearly half length of head, $1^1/_2$ in its own length, surrounded by 12 scales. Scales with longitudinal striae. Colour of specimen examined probably faded. Silvery, with brownisch upper surface. A dark broad band from back behind nape to above pectorals, a second broad band from base of dorsal to ventrals, a third band across the tail to base of anal but not continued below lateral line, a fourth band nearly reduced to a large patch at end of caudal peduncle. An indication of a longitudinal band immediately above the

lateral line, beginning somewhat before second band and nearly reaching to the third. After BLEEKER and GÜNTHER the four crossbands of their specimens blackish violet, edged with yellow. Length 88 mm.

Habitat: Singapore!; Borneo (river Kahajan and river Kapuas).

11. **Puntius fasciatus** (Blkr.).

Barbus fasciatus Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 190.
Systomus (Barbodes) fasciatus Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 344.
Puntius (Barbodes) fasciatus Bleeker. Atl. Ichth. III. 1863, p. 103.
Barbus fasciatus Günther, Cat. Brit. Mus. VII. 1868, p. 122.
Barbus fasciatus Vaillant, Nouv. Arch. Mus. Hist. Nat. (3) V. 1893, p. 78.
Barbus fasciatus Volz, Revue suisse de Zool. XII. 1904, p. 475.

D. 4.8; A. 3.5; P. 1.14—16; V. 2.8; L. l. 27; L. tr. $\frac{5\ (4\frac{1}{2})}{4\frac{1}{2}}$.

Compressed, oblong, dorsal profile nearly straight. Height 2.8—2.9, 3.7 in length with caudal. Head 3.5—3.6, 4.5—4.9 in length with caudal. Eye somewhat more than 3, nearly equal to snout, slightly less than interorbital space. Snout somewhat pointed, mouth terminal. Rostral barbels shorter than maxillary ones, which are somewhat longer or more than twice longer than eye. Origin of dorsal opposite to 9th or 10th scale of lateral line and opposite to origin of ventrals, separated by 10—11 scales from occiput, about in the middle of a line connecting end of snout and base of caudal. Dorsal nearly truncate, its fourth osseous spine very feeble and finely serrated behind, somewhat shorter than head. Anal emarginate, much shorter than head without snout. Ventrals separated by 3 to 4 scales from lateral line, equal to pectorals, reaching anus. Pectorals about equal to head without snout. Caudal forked, the lobes pointed, somewhat longer than head. Least height of caudal peduncle twice in head or nearly so, $1\frac{1}{2}$ or less in its own length, surrounded by 12 scales. Colour yellowish brown. Body with dark brown longitudinal bands, one in the lateral line, 3 above it and one or two below it and a median one on the back. Length 120 mm.

Nom. indig.: Seluang maram (Djambi).

Habitat: Sumatra (Muara kompeh, Djambi!, Lahat, Taluk!, Gunung Sahilan!, affluent of river Kwantan, Upper Langkat);

Banka; Borneo (Mandhor, river Kapuas, river Kahajan, river Akar [1]).

In swamps, brooks and rivers.

12. Puntius tawarensis n. sp.

D. 4.7—8; A. 3.5; P. 1.16; V. 1.8—9; L. l. 25; L. tr. $\frac{5\,(4\frac{1}{2})}{1}$.
$4\frac{1}{2}$

Oblong, dorsal profile of head slightly ascending in a straight line, behind nape slightly arched or slowly ascending, often with a sudden elevation behind the nape. Height 3.3—3.4, 4.1—4.2 in length with caudal. Head 3.2—3.3, 4—4.1 in length with caudal. Eye 5, 1.6—1.8 in pointed snout, which is somewhat longer than interorbital space. Mouth nearly terminal, the upper lip overlapping the lower one. Maxillary barbels more than $1\frac{1}{2}$ to 2 times as long as eye, the rostral ones shorter. Origin of dorsal opposite to 8th or 9th scale of lateral line, and opposite to or slightly before origin of ventrals, separated by 9—10 scales from occiput, opposite to the middle of a line connecting end of snout and base of caudal or somewhat before or behind it. Dorsal slightly emarginate, the fourth ossified spine very strong, with numerous strong teeth behind, its stiff part equal to head without snout or shorter. Anal nearly straight, its height equal to about half length of head. Ventrals and pectorals subequal, ventrals not reaching anus and separated by 3 scales from lateral line. Pectorals not reaching base of ventrals, equal to head without snout or shorter. Caudal bifurcate, its lobes pointed, shorter than head. Caudal peduncle slender, its least height about $1\frac{1}{2}$ in its length and about $2\frac{1}{2}$ in length of head, surrounded by 12 scales. Scales without radiating lines. Colour of formol specimens greyish, brown above and with a faint dark lateral band above the lateral line. Length 137 mm. [Type of the species in the zoological Museum of Amsterdam].

Nomen indig.: Kĕpĕrás (Gaju). The Gaju people call the specimens with a gibbosity behind the nape Kawan, the Atjeh people Kaduan, and pretend that the scales of the Kawan are soft, those of the Kĕpĕrás hard.

Habitat: Sumatra (Atjeh; Lake Laut Tawar!); collected by Mr. v. d. Werff.

1) We had occasion to examine a specimen of this species labeled to be from Ceylon, belonging to the Zoological Museum of Basel.

13. Puntius microps (Gthr.).

Barbus microps Günther, Cat. Brit. Mus. VII. 1868, p. 124.

D. 4.8; A. 3.5; P. 1.15—16; V. 1.8; L. l. 26; L. tr. $\frac{4\frac{1}{2}}{1}$.
$\frac{}{4\frac{1}{2}}$

Oblong. Dorsal profile evenly convex from snout to dorsal, or with a slight elevation behind nape. Height 3.4—3.7, 4.2—4.6 in length with caudal. Head 3.7—3.8, 4.6 in length with caudal, its upper profile strongly ascending. Eye 4.6 to nearly 5, about $1^1/_2$ in snout, which is pointed and somewhat prominent and equal to interorbital space. The upper lip overlapping the lower one. Lips rather thin, continuous. Barbels subequal, the maxillary ones about twice as long as the eye. Origin of dorsal opposite to 8th scale of lateral line and to origin of ventrals, separated by 9—10 scales from occiput, conspicuously before the middle of a line connecting end of snout and base of caudal. Dorsal truncate, its fourth osseous spine denticulated behind, with its flexible portion longer than head without snout. Anal truncate, its height about twice in length of head. Ventrals shorter than pectorals, not reaching anus, separated by $2^1/_2$ to 3 scales from lateral line. Pectorals not reaching ventrals, about equal to distance between nostrils and hind-border of operculum. Caudal bifurcate, the lobes somewhat rounded, shorter than head. Least height of caudal peduncle somewhat more or less than twice in length of head, more than $1^1/_2$ in its own length, surrounded by 12 scales. Scales with faint longitudinal lines, often anastomising near their base. Colour silvery, upper surface brownish. Length 125 mm. [Type of the species in the British Museum seen by us].

Habitat: Java (subterraneous river in cave Djomblang near Gunung Sewu in Djocja!). GÜNTHER gives as locality for the types: „Java?".

Some of the specimens from the above named cave, collected by Mr. E. JACOBSON, have lost one or both eyes, probably through mutilation by *Crustacea*.

14. Puntius binotatus (C.V.)

Barbus maculatus van Hasselt, Algem. Konst- en Letterbode 1823, II. p. 132 (no description).

Barbus binotatus Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 168.

Barbus maculatus Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 195.

Barbus oresigenes Bleeker, Verh. Batav. Gen. XXIII. (1849) 1850, Bijdr. Ichth. Midden- en Oost Java, p. 17.

Barbus blitonensis Bleeker, Nat. Tijdschr. Ned. Indië III. (1851) 1852, p. 96.
Barbus kusanensis Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 429.
Barbus polyspilos Bleeker, Nat. Tijdschr. Ned. Indië XIII. 1857, p. 351.
Systomus (*Barbodes*) *maculatus* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 347.
Systomus (*Barbodes*) *goniosoma* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 349.
Puntius (*Barbodes*) *maculatus* Bleeker, Atl. Ichth. III. 1863, p. 104.
Puntius (*Barbodes*) *goniosoma* Bleeker, Atl. Ichth. III. 1863, p. 105.
Puntius (*Barbodes*) *maculatus* Kner, Novara Exp. I. Fische, 1865—1867, p. 346.
Barbus maculatus Günther, Cat. Brit. Mus. VII. 1868, p. 123.
Barbus goniosoma Günther, Ibid. p. 124.
Puntius (*Barbodes*) *maculatus* Vinciguerra, Ann. Mus. Civ. Genova XIV. 1879, p. 391.
Puntius (*Barbodes*) *goniosoma* Vinciguerra, Ann. Mus. Civ. Genova XIV. 1879, p. 396.
Barbus maculatus var. Günther, Challenger Exp. Report Shore Fishes 1880, p. 53.
Barbus goniosoma Vaillant, Nouv. Arch. Mus. Hist. Nat. (3) V. 1893, p. 81.
Barbus (*Puntius*) *maculatus* Perugia, Ann. Mus. Civ. Genova (2) XIII. 1893, p. 245.
Barbus palavanensis Boulenger, Ann. Mag. Nat. Hist. (6) XV. 1895, p. 186.
Barbus (*Barbodes*) *maculatus* Steindachner, Abh. Senckenb. Nat. Ges. XXV. 1901, p. 453.
Barbus maculatus Volz, Zool. Jahrb. Abth. Syst. XIX. 1903, p. 398.
Barbus maculatus Volz, Revue Suisse Zool. XII. 1904, p. 475.
Barbus maculatus Popta, Notes Leyden Mus. XXVII. 1906, p. 138.
Barbodes binotatus Jordan & Seale, Proc. U. S. Nat. Mus. XXXIII. 1908, p. 538 (salve syn.).
?*Barbus ivis* Seale, Philipp. Journ. of Science 1909, p. 494.
Barbus maculatus v. hagenii Popta, Notes Leyden Mus. XXXIV. 1911, p. 9.
Barbodes maculatus Bean & Weed, Proc. U. S. Nat. Mus. XLII. 1912, p. 593.

D. 4.8; A. 3.5; P. 1.15—17; V. 1.8—9; L. l. 23—27; L. tr. $\frac{4\frac{1}{2}\,(5).}{4\frac{1}{2}}$

A very variable species, also in form of body of large specimens of equal size. Height 2.5—3.4, 3.3—4.1 in length with caudal. Head 3.6—3.9; 4.5—5 in length with caudal. Eye 3.3—4.5 in head, 1 to 1.7 in snout, 1.3 to nearly 2 in interorbital space. Snout pointed or more or less blunt. Mouth terminal or nearly so. Lips rather thin, continuous. Rostral barbels longer than eye, maxillary ones longer even to more than twice diameter of eye. Origin of dorsal opposite to 8th or 9th scale of lateral line, behind origin of ventrals or opposite to it, nearer to caudal or opposite to the middle of a line connecting end of snout and base of caudal; separated by 9—10 scales from occiput. Dorsal truncate or nearly so. Fourth osseous spine more or less strong, conspicuously serrated behind, its height somewhat

less than length of head, its stiff portion about equal to head without snout. Anal truncate or nearly so, its height equal to half head or somewhat longer or shorter. Ventrals shorter than pectorals, not reaching anus, separated by ($2^1/_2$) 3 scales from lateral line. Pectorals 1.2—1.4 in head, equal to head without snout or longer. Caudal bifurcate, the lobes more or less rounded, equal to head or somewhat longer or shorter. Least height of caudal peduncle 1.5—2 times in length of head, equal to its own length or $^1/_3$ shorter, surrounded by 12 scales. Scales with longitudinal lines. In smaller specimens generally a larger or smaller blackish spot at the base of the anterior dorsal rays

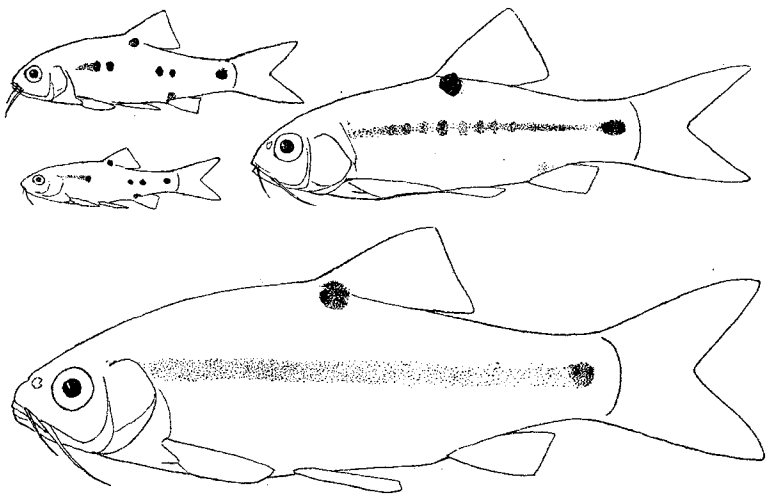


Fig. 74. *Puntius binotatus* (C.V.). Four stages of growth to show the change of the markings according to size. × 1.3.

and with an other less distinct one in the middle of the root of the caudal, preceded by a faint dark longitudinal band. This band develops out of a series of more or less confluent black spots. In still younger specimens this series is represented by four or three widely separate black spots, they have besides a black spot at the base of the anal, which disappears later on. Large specimens often show no markings at all, they may also show nuptial epidermoidal pearls or violet spots in the centre of each scale. Length about 170 mm.

Nomen indig.: Bunter and Béntér (Sundan.); Wader tjakul (Javan.); Tanah and Sepadak (Benkulen); Tewaring (River Bo); Sunow (Kajan); Pujan (Bandjermassin),

Habitat: In brooks, rivers, ponds all over Sumatra, Nias, Java, Bali, Lombok, Borneo, Banka, Biliton, Singapore. — Malacca, Philippines. — Numerous specimens seen by us from Sumatra, Nias, Java, Borneo.

GÜNTHER mentions l. c. among the localities of *Barbus binotatus* "1 young Amboyna. From the collection of Mad. Ida Pfeiffer." This is without question erroneous, as no Cyprinid occurs in Ambon.

Note: We have included *Barbus palavanensis* Blgr., the type of which we have seen in the British Museum, in the above list of synonyms of *Puntius binotatus* (C.V.), as we consider it to be a colour-variety of that species, where the markings of the immature (see our figure 74, p. 189) have been retained.

15. Puntius platysoma (Blkr.).

Barbus platysoma Bleeker, Nat. Tijdschr. Ned. Indië IX. 1855, p. 404.
Systomus (Barbodes) platysoma Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 336.
Puntius (Barbodes) platysoma Bleeker, Atl. Ichth. III. 1863, p. 100.
Barbus platysoma Günther, Cat. Brit. Mus. VII. 1868, p. 122.

D. 4.8; A. 3.5; P. 1.12—13; V. 2.8; L. l. 26; L. tr. $\frac{7}{1.5}$.

Strongly compressed, much elevated, dorsal profile much arched. Height $1^3/_4$, almost $2^1/_2$ in length with caudal; head 3.6, $5^2/_3$ in length with caudal [1]). Eye about 3, longer than the short, obtuse snout, 1.4 in interorbital space. Barbels subequal, not much longer than eye. Origin of dorsal behind that of the ventrals, separated by about 10 scales from occiput and nearer to root of caudal than to end of snout. Dorsal emarginate, its fourth osseous spine strong, coarsely serrated, its stiff portion being as long as head without snout, with its flexible portion longer than head. Anal emarginate, much lower than dorsal. Ventrals and pectorals subequal, $5^2/_3$ in length, slightly shorter than head, separated by $3^1/_2$ series of scales from lateral line, nearly reaching anal; the pectorals nearly reaching ventrals. Caudal deeply incised, the lobes pointed, longer than head. Caudal peduncle short, twice as high as long, its height $1^2/_5$ in length of head, surrounded by about 18 scales [1]). Coloration uniform.

1) The single specimen known, preserved in the British Museum and studied by us, is much damaged; the measures including the caudal are taken from BLEEKER's description.

Length of the single specimen known 180 mm. [The single specimen known, in the British Museum, seen by us].

Nomen indig.: Wader (Javan.).

Habitat: Only one specimen known from Java, Surakarta

16. **Puntius anchisporus** (Vaill.).

Barbus anchisporus Vaillant, Notes Leyden Mus. XXIV. 1902, p. 96.

D. 4.8; A. 3.5; P. 1.13—14; V. 1.8; L. l. 23; L. tr. $\frac{5\frac{1}{2}}{1}$.
$5\frac{1}{2}$

Oblong, elevated. Dorsal profile strongly arched, with a concavity from snout to nape. Height 2 or somewhat more, about $2^3/_4$ in length with caudal. Head 3.2—3.3, 4.2—4.3 in length with caudal. Eye 2.6—3, not much longer than snout and about equal to interorbital space. Snout somewhat pointed, mouth nearly terminal. Four barbels, shorter than eye, the rostral ones the shortest. Origin of dorsal opposite to 9th scale of lateral line, separated by 10 scales from occiput, about in the middle of a line connecting frontmargin of eye and caudal. Dorsal nearly truncate. Fourth dorsal spine strongly ossified and strongly denticulated, with its flexible portion about equal to head without snout, its stiff portion equal to half head. Anal nearly truncate, its height more than half head. Ventrals and pectorals equal, as long as head without snout. Ventrals reaching anus, separated by 4 scales from 7th scale of lateral line. Caudal deeply emarginate, slightly longer than head. Least height of caudal peduncle about 1.8 in head, and somewhat shorter than its own length, surrounded by 14 scales, 7 of which are above the lateral line. Scales longitudinally striated. Colour of formol specimens pale yellowish, with four transverse dark brown bands, the first through the eye to lower border of praeoperculum, bent backwards above the eye and meeting that of the other side, the second one before dorsal to base of ventrals, diminishing in size from above to below, occupying 3—4 scales in its broadest part, the third immediately behind dorsal to base of anal and continued on base of dorsal and anal, or the band on the dorsal is an intramarginal one (VAILLANT), fourth one at the end of the caudal peduncle. Traces of red on the fins and of a red patch behind operculum. Base of scales with a light brown transverse band. Length 60 mm.

Habitat: Borneo (river Mahakam, Kapuas!).

17. Puntius sumatranus (Blkr.).

Capoëta tetrazona Bleeker, Nat. Tijdschr. Ned. Indië IX. 1855, p. 262.
Systomus (Capoëta) sumatranus Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 354.
Puntius (Capoëta) sumatranus Bleeker, Atl. Ichth. III. 1863, p. 108.
Barbus sumatranus Günther, Cat. Brit. Mus. VII, 1868, p. 140.
Barbus sumatranus Vaillant, Nouv. Arch. Mus. Hist. Nat. (3) V. 1893, p. 82.

Differs from the preceding species only in the absence of the rostral barbels, in having only 12 scales round the caudal peduncle and in having only the anterior 8 or 9 scales of the lateral line perforated. The second transverse band is narrower. Length 70 mm.

Habitat: Sumatra (Lahat, Taluk!, Ringat!, Deli); Borneo (Bengkayang, Mandhor, Danau Sriang, river Kapuas). — Siam [British Museum].

DUNCKER (Mitth. Naturh. Mus. Hamb. XXI. 1904, p. 180) describes a colour variety from Malacca in which the third transverse band is dorsally bent backwards, and not confluent with a black patch at the base of the dorsal, which is continued on the base of its rays.

18. Puntius elongatus (Seale).

Barbus maculatus Vaillant, Nouv. Arch. Mus. Hist. Nat. (3) V. 1893, p. 79. (nec C.V.).
Barbus elongatus Seale, Philippine Journ. Sci. V. n°. 4, 1910, p. 265.

D. 3.8; A. 3.5; P. 16; V. 1.8; L. l. 28—29; L. tr. $\frac{4\frac{1}{2}}{1}$.
$\frac{}{4\frac{1}{2}}$

Oblong, dorsal profile rather gibbous, that of head straight, declivous. Height 3.4—3.6, 4.3—4.4 in length with caudal. Head more or less than 4, more or less than 5 in length with caudal. Eye 4.5—4.8, conspicuously shorter than snout and about twice in flattened interorbital space, situated in the anterior half of the head. Snout convex, slightly prominent, mouth arched, its angles reaching below frontborder of eyes. Four about equal barbels, half as long as head or somewhat longer. Origin of dorsal opposite to 9th scale of lateral line, separated by 9—10 scales from occiput and conspicuously before the middle of a line connecting end of snout and root of caudal. Third dorsal ray weakly ossified, serrated behind; its total length about $^1/_4$ shorter than length of head. Dorsal

nearly truncate. Origin of anal opposite to 17th scale of lateral line, its height less than that of dorsal. Outer ray of pectorals and ventrals with a thread-like prolongation. Pectorals with that prolongation, somewhat longer than head; reaching on ventrals. Ventrals much shorter than pectorals, their origin separated by $2^1/_2$ scales from the 10th scale of the lateral line. Ventrals not reaching anus. Caudal deeply forked, equal to head. Least height of caudal peduncle 1.5—1.6 in its own length, 1.7 in head, surrounded by 16 scales. Colour silvery with a slight shade of yellowish; four round black spots on middle line of sides, one at base of caudal, one at origin of lateral line, two on the lateral line near the middle. A black spot at base of dorsal and at origin of anal. In young specimens a black spot at the end of first anal rays. Length more than 100 mm.

Habitat: Borneo (Tidung on river Sebuku, North East Borneo!, Sandakan, Kina Balu?).

19. **Puntius strigatus** (Blgr.).

Barbus strigatus Boulenger, Ann. Mag. Nat. Hist. (6) XIII. 1894, p. 247.

D. 3.8; A. 3.5; L. l. 29; L. tr. $\frac{6}{1}$.
$\frac{}{4}$

Height almost $2^1/_2$, about $3^1/_3$ in length with caudal; head 4.1, 5.6 in length with caudal. Eye 3, nearly equal to snout, somewhat shorter than interorbital space. Rostral barbel slightly longer than eye, $^3/_4$ length of maxillary barbel. Origin of dorsal opposite to 10th scale of lateral line, separated by 11 scales from occiput; dorsal concave, its height equal to length of head; its third spine strong and serrated, $^4/_5$ length of head. Origin of anal below 17th scale of lateral line. Its height $^5/_6$ length of head, its spines weak. Origin of ventrals separated by 3 scales from 9th scale of lateral line. Ventrals shorter than pectorals, which are about equal to length of head. Caudal much longer than head. Least height of caudal peduncle $1^2/_3$ in length of head and about $1^1/_4$ in its own length, surrounded by 14 scales. Grey above, silvery beneath, with seven blackish longitudinal streaks running between two series of scales; pectorals blackish above. Total length 168 mm. [Type of the species in the British Museum seen by us].

Habitat: Borneo (Bongon).

20. Puntius huguenini (Blkr.).

Barbus huguenini Bleeker, Nat. Tijdschr. Ned. Indië IV. 1853. p. 294.
Systomus (Barbodes) Huguenini Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 332.
Puntius (Barbodes) Huguenini Bleeker, Atl. Ichth. III. 1863, p. 98.
Barbus huguenini Günther, Cat. Brit. Mus. VII. 1868, p. 120.

D. 4.8; A. 3.5; P. 1.14—15; V. 2.7—8; L. l. 30—32; L. tr. $\frac{5\frac{1}{2}—6}{1}$.
$\frac{}{5—5\frac{1}{2}}$

Strongly compressed, back convex, profile of neck and head sloping downward nearly in a straight line. Height 2.5—2.7, 3.3—3.6 in length with caudal. Head rather small, 4.3—4.7, about 5.7—6.3 in length with caudal. Eye 3.2—4.6, equal to or conspicuously shorter than snout, 1.2 to more than twice in interorbital space. Rostral and maxillary barbels subequal and about equal to or longer than diameter of eye. The origin of the dorsal is a little behind the vertical from that of the ventrals, midway between the end of the snout and the root of the caudal and separated by 10 scales from occiput. Dorsal acute, its height somewhat more or equal to length of head; its osseous ray is strong with the serrature very conspicuous and rather coarse, the denticulations being numerous and closely set, and with the stiff portion being longer than the head without snout. Anal acute, emarginate, its height not much less than that of dorsal. Pectorals and ventrals subequal; in the large specimen the outer ventral rays prolonged and reaching anus; pectorals slightly shorter than head. There are two and a half to three longitudinal series of scales between the lateral line and the root of the ventral fin. Caudal deeply incised, its lobes acute, much longer than head. Least height of caudal peduncle about equal to its own length, 1.4—1.7 in length of head, surrounded by 14 scales. Silvery, back darker, base of scales with a transverse narrow band. Length 460 mm. [The type of the species of 176 mm. length as also a specimen of 460 mm. length from lake Korintji, both in the British Museum, have been seen by us].

Habitat: Sumatra (river Ombilin! and lake Korintji!).

21. Puntius orphoides (C. V.).

Barbus rubripinna van Hasselt, Algem. Konst- en Letterbode 1823, II. p. 132 (no description).
Barbus gardonides Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 157 (p.p. spec. javan. tantum).

Barbus orphoides Cuvier & Valenciennes, ibid. p. 193.
Barbus rubripinnis Cuvier & Valenciennes, ibid. p. 194.
Barbus saranganella Bleeker, Verh. Bat. Gen. XXIII (1849) 1850, Ichth. Midden- en Oost-Java p. 16.
Barbus rubripinnis Bleeker, Nat. Tijdschr. Ned. Indië IX. 1855, p. 406.
Systomus (*Barbodes*) *rubripinna* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 337.
Puntius (*Barbodes*) *rubripinna* Bleeker, Atl. Ichth. III. 1863, p. 100.
Barbus rubripinnis Günther, Cat. Brit. Mus. VII. 1868, p. 116.
Barbodes rubripinnis Jordan & Seale, Proc. U. S. Nat. Mus. XXXIII. 1908, p. 538.

D. 4.8; A. 3.5; P. 1.14—16; V. 1.8; L. l. 31—34; L. tr. $\frac{5—5\frac{1}{2}}{1}$.
$5\frac{1}{2}$

Body compressed, somewhat elevated. Dorsal profile from snout to dorsal arched. Height about $2^1/_2$ to almost 3, more than 3—$3^1/_2$ in length with caudal. Head 3.2 to nearly 4, 4.2 to nearly 5 in length with caudal. Eye 4—6 in adult specimens, shorter than snout, situated far below the upper profile of the head, the interorbital space being very convex and nearly twice the diameter of the eye. Snout obtuse. Barbels subequal, equal to or longer than eye. Origin of dorsal opposite to 9th scale of lateral line, slightly behind that of ventrals, separated by 10 or 11 scales from occiput, before the middle of a line connecting end of snout and base of caudal. Dorsal emarginate, fourth spine strongly ossified, finely serrated behind by about 30 serratures; with its flexible part somewhat shorter than head; its stiff portion somewhat more than postorbital part of head. Anal nearly truncate, its height shorter than head without snout. Ventrals shorter than pectorals, not reaching anus, separated by 3—$3^1/_2$ scales from lateral line. Pectorals about equal to head without snout. Caudal bifurcate, the lobes somewhat pointed, as long as or slightly longer than head. Least height of caudal peduncle 1.6 in head, 1.2—1.3 in its own length, surrounded by 16 scales. Scales with radiating longitudinal lines, they may have nuptial, pearly tubercles. Silvery, upper surface brownish, in young specimens a black blotch near end of lateral line. Caudal with a broad blackish marginal band above and below. Length 250 mm.

Nomen indig.: Marotja, Marotjotja, Wadonon (Malay. Batavia); Sisik-milik, Ampa (Sundan.); Brek, Pekkiseh, Lundjar, Wader (Javan.).

Habitat: Java (Batavia, Sunter!, Tjibitong, Bekassi!, Serang, Rankasbetong, Tjampea, Buitenzorg, Banjumas, Purwuredjo,

Pasuruan, Grati, Ngantang); Madura (Sumenep!); Borneo (Danau Sriang, according to von Martens, Sandakan! [British Museum]). — Siam.

22. Puntius bramoides (C.V.).

Barbus bramoides Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 160.
?*Barbus hypselonotus* Cuvier & Valenciennes, Ibid. p. 168.
Barbus wadon Bleeker, Verh. Bat. Gen. XXIII. (1849) 1850, Ichth. Midden- en Oost-Java, p. 14.
Barbus erythropterus Bleeker, Ibid. p. 15.
Barbus amblycephalus Bleeker, Nat. Tijdschr. Ned. Indië VIII, 1855, p. 166.
Barbus macrophthalmus Bleeker, Nat. Tijdschr. Ned. Indië IX. 1855, p. 404.
?*Barbus hypselonotus* Bleeker, Nat. Tijdschr. Ned. Indië XIII. 1857, p. 349.
Barbus bramoides Bleeker, Nat. Tijdschr. Ned. Indië XVI. 1858—1859, p. 357.
Systomus (Barbodes) amblycephalus Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 324.
Systomus (Barbodes) erythropterus Bleeker, Ibid. p. 325.
Systomus (Barbodes) bramoides Bleeker, Ibid. p. 327.
Systomus (Barbodes) hypselonotus Bleeker, Ibid. p. 334.
Systomus (Barbodes) macrophthalmus Bleeker, Ibid. p. 335.
Puntius (Barbodes) amblycephalus Bleeker, Atl. Ichth. III. 1863, p. 94.
Puntius (Barbodes) erythropterus Bleeker, Ibid. p. 95.
Puntius (Barbodes) bramoides Bleeker, Ibid. p. 95.
Puntius (Barbodes) hypselonotus Bleeker, Ibid. p. 98.
Puntius (Barbodes) macrophthalmus Bleeker, Ibid. p. 99.
Barbus bramoides Günther, Cat. Brit. Mus. VII. 1868, p. 117.
Barbus bramoides Popta, Notes Leyden Museum XXVII. 1906, p. 138.

D. 4.8; A. 3.5; P. 1.14—16; V. 2.8; L. l. 28—31; L. tr. $\frac{6\frac{1}{2}}{1}$ / $\frac{}{5\frac{1}{2}}$.

Strongly compressed, elevated, dorsal profile arched. Height $2^1/_2$, $3—3^1/_4$ in length with caudal. Head $3^3/_4—4^3/_4$, $5^1/_2—6^3/_5$ in length with caudal. Eye $2^1/_2—3^1/_4$, much longer than snout and equal to or nearly $^1/_2$ shorter than interorbital space. Snout very short and obtuse; four subequal barbels, shorter than or equal to eye. Origin of dorsal above or slightly behind origin of ventrals and a little before the middle of a line connecting the root of the caudal and the end of the snout, situated above the 10th to 11th scale of lateral line, separated by 11—13 scales from occiput. Dorsal emarginate. Fourth osseous ray strong, coarsely serrated by about 20 serratures; its stiff portion about equal to distance between nostril and hindborder of operculum; with its flexible portion equal to or longer than head. Anal emarginate, its height more or less shorter than that of dorsal. Ventrals and pectorals subequal, not much shorter than head,

6—6$^3/_4$ in total length. Ventrals separated by 3$^1/_2$ series of scales from lateral line. In large specimens the ventrals do not reach the anal, the pectorals not the ventrals. Caudal deeply incised, the lobes pointed, longer than head. Caudal peduncle surrounded by 16 scales; its height 1$^1/_3$—1$^1/_2$ in length of head. Length nearly 300 mm.

Nom. indig.: Lawak, lalawak, wadon (Malay.); Gengehek, Turap-hawu, Regis (Sundan.); Wader, Wader merah, Lukás (Javan.); Halap, Halap dua (river Bŏ); Iblab, Bihee (river Bluu).

Habitat: Java (Batavia, Tjibitong, Tandjong Oost, Buitenzorg, Tjampea, Tjikao, Parongkalong, Kuningan, Banjumas, Ngawi, Surabaya, Kediri); Borneo (Pengaron on an affluent of river Barito; river Bŏ, affluent of river Mahakam; river Bluu, affluent of upper Mahakam, Baram river). — Siam.

23. **Puntius collingwoodi** (Gthr.).

Barbus collingwoodii Günther, Cat. Brit. Mus. VII. 1868, p. 483.
Barbus strigatus Vaillant, Notes Leyden Mus. XXIV. 1902, p. 98 (nec Boulenger).
Barbus boulengeri Popta, Notes Leyden Mus. XXV. 1904—1905, p. 172. — Ibid. XXVII. 1906, p. 132.

D. 4.8; A. 3.5; P. 1.14—15; V. 1.8; L. l. 32—34; L. tr. $\frac{5\frac{1}{2}—6\frac{1}{2}}{1}$.
$\frac{}{4\frac{1}{2}—5\frac{1}{2}}$

Compressed, oval. Height 2.6—3.2 [1]), 3.6—4.4 in length with caudal. Head 4—4.5, 5.4—5.5 in length with caudal. Eye more than 3, slightly longer than or equal to snout and somewhat shorter than interorbital space, which is nearly flat. Snout rounded. Four barbels of about equal size, longer than eye. Origin of dorsal opposite to 12th scale of lateral line and to middle of length, separated by 12—14 scales from occiput. Dorsal emarginate. The fourth spine coarsely serrated behind by about 20 serratures; its stiff portion $^2/_3$ of length of head, with its flexible part somewhat longer than head. Height of dorsal equal to length of head. Anal emarginate, its height about equal to head without snout. Origin of ventrals separated by 2$^1/_2$ scales from 10th—11th scale of lateral line, shorter than pectorals, not reaching anal. Pectorals slightly shorter than head, nearly or not reaching ventrals. Caudal deeply incised, lobes pointed, much longer than head. Least height of caudal peduncle 1.7—2 in head, 1.3—1.7 in length

1) GÜNTHER says: "its depth is one-fourth of the total length (without caudal)". This must be a misprint.

of caudal peduncle, surrounded by 16 scales. Yellowish, dorsally brown or yellowish brown. Base of dorsal and lateral scales with a transverse brown line. Upper part of dorsal brown, a blackish intermarginal band on the upper and lower caudal lobe. Length 215 mm. [Type of the species in the British Museum seen by us, as also of *B. strigatus* Vaillant (nec Blgr.) and of *B. boulengeri* Popta in the Leyden Museum].

Nom. indig.: Hanja (Bongan and Howong).

Habitat: Borneo (rivers Raun, Bongan and Howong, affluents of river Kapuas, river Bŏ, affluent of river Mahakam, Baram river! [Brit. Mus.], Senah!, Sarawak!, Tinjar river!, [Brit. Mus.].

This species is closely related to *P. orphoides*, from which it differs by having one scale less between lateral line and ventrals and by having some scales more between dorsal and occiput. Moreover the dorsal is higher and the pectorals are somewhat longer in *P. collingwoodi* than in *P. orphoides*.

24. **Puntius javanicus** (Blkr.).

Barbus gonionotus Bleeker, Verh. Bat. Gen. XXIII. (1849) 1850, Ichth. Midden- en Oost-Java, p. 15.
Barbus javanicus Bleeker, Nat. Tijdschr. Ned. Indië IX. 1855, p. 403.
Barbus koilometopon Bleeker, Ibid. XIII. 1857, p. 347.
Systomus (Barbodes) javanicus Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 328.
Systomus (Barbodes) koilometopon Bleeker, Ibid. p. 330.
Systomus (Barbodes) gonionotus Bleeker, Ibid. p. 331.
Puntius (Barbodes) javanicus Bleeker, Atl. Ichth. III. 1863, p. 96.
Puntius (Barbodes) gonionotus Bleeker, Ibid. p. 97.
Puntius (Barbodes) koilometopon Bleeker, Ibid. p. 97.
Barbus javanicus Günther, Cat. Brit. Mus. VII. 1868, p. 118.
Barbus gonionotus Günther, Ibid. p. 119.

D. 4.8; A. 3.6; P. 1.14—15; V. 1.8; L. l. 29—31; L. tr. $\frac{6}{1}$.

Strongly compressed, elevated, dorsal profile arched, often concave above the occiput. Height about 2.4—2.6, more than 3 in length with caudal. Head 4—4.3, about 5.5 in length with caudal. Eye somewhat more or less than 4, somewhat shorter than snout and about twice in interorbital space. Snout pointed, mouth terminal. Barbels very minute or rudimentary, especially the upper ones, which sometimes disappear entirely. Origin of dorsal opposite to 10th scale of lateral line, behind origin

of ventrals, somewhat before or behind middle of a line connecting end of snout and base of caudal, separated by 11 scales from occiput. Dorsal emarginate, its fourth osseous spine very strong, strongly dentated behind, somewhat longer than head, its stiff portion not much shorter than head. Anal emarginate, its first prolonged rays about equal to head without snout and opposite to 19th scale of lateral line. Pectorals and ventrals subequal, the ventrals not reaching anus, separated by $3—3^1/_2$ scales from lateral line; pectorals not much shorter than head. Caudal deeply emarginate, the lobes somewhat rounded, longer than head. Least height of caudal peduncle about 1.5 in head, about equal to the length of the caudal peduncle, surrounded by 16 scales. Scales with numerous undulated longitudinal lines, tubes of lateral line very short. Silvery, base of scales brownish. Length 330 mm.

Nom. indig.: Lawak, Lalawak (Malay.); Turu behaw, Turub hawu (Sundan.); Tawĕs, Badir (Javan.).

Habitat: Sumatra (Palembang); Java (Batavia!, Krawang, Bekassi, Buitenzorg!, Tjandjur, Lake Kamodjing near Tjihampeh!, Garut!, Parongkalong, Kudus!, Fishpond near Tasikmalaja!, Ngawi, Gempol, river Brantas!, Tulung Agung!). — Siam.

Note. BLEEKER has founded his *Puntius* (*Barbodes*) *koilometopon* on two specimens of 153 and 164 mm. which, according to him, differ from *Puntius javanicus* in having a more slender operculum, the length of which is contained twice in its height, whereas it is contained $1^2/_3—1^3/_4$ times in *javanicus*. Moreover the body is higher (height about 3 in length with caudal) and the dorsal profile very much concave at nape. GÜNTHER (Cat. Brit. Mus. VII. 1868, p. 119), who had the two typical specimens at his disposition, says: "I do not think that *B. koilometopon* is specifically different from *B. javanicus*. The specimen figured by BLEEKER has the body conspicuously elevated, the pectoral extending beyond the base of the ventrals; but this is much less the case in the second specimen, so that it is even doubtful whether this form can be considered a constantly distinct variety." After reexamination of the two above named specimens, we agree with GÜNTHER that they do not differ specifically from *P. javanicus* Blkr. The difference in the operculum, named by BLEEKER, does not exist. The height of one of the specimens is nearly 2.2 and of the other 2.3, whereas we find the height of *P. javanicus* as 2.4—2.6.

25. Puntius sunieri n.sp.

D. 3.8; A. 3.6; P. 1.17; V. 1.8; L. l. 29—30; L. tr. $\frac{6}{1}$.
$\frac{}{4\frac{1}{2}}$

Strongly compressed, elevated. Dorsal profile arched from snout to dorsal. Height 2.6, 3.3 in length with caudal. Head 4, 5.2 in length with caudal. Eye 3.6, about equal to snout and nearly twice in somewhat flattened interorbital space. Snout bluntly rounded, mouth terminal. Barbels 4, long, the maxillary ones more than $1\frac{1}{2}$ diameter of eye, the rostral ones somewhat shorter. Origin of dorsal opposite to 10th scale of lateral line, about 2 scales behind that of ventrals, somewhat before middle of a line connecting end of snout and base of caudal, separated by 11 scales from occiput. Dorsal deeply emarginate; the third osseous spine very strong, strongly denticulated behind and somewhat shorter than head, its stiff portion about equal to head without snout. Anal emarginate, its third, weak spine equal to head without snout. Origin of anal below 17th scale of lateral line. Ventrals shorter than pectorals, nearly reaching anus, separated by $2\frac{1}{2}$ scales from lateral line. Pectorals with the outer rays prolonged, longer than head, reaching ventrals. Caudal deeply forked, lobes pointed, much longer than head. Least height of caudal peduncle somewhat more than once in its own length, 1.6 in that of head, surrounded by 16 scales. Silvery, upper surface darker, base of scales of upper half of body darkish. Dorsal, caudal and pectorals with a dark hue. A rather broad black band behind operculum. Length of single specimen 287 mm. [Type of the species in the zoological Museum of Amsterdam].

Habitat: North East Borneo (river Sedalit, affluent of river Sambakung!). Named in honour of Dr. A. L. J. SUNIER.

26. Puntius bulu (Blkr.).

Systomus bulu Bleeker, Nat. Tijdschr. Ned. Indië II. 1851, p. 207.
Systomus (Systomus) bulu Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 360.
Puntius (Puntius) bulu Bleeker, Atl. Ichth. III, 1863, p. 110.
Barbus bulu Günther, Cat. Brit. Mus. VII. 1868, p. 149.

D. 4.8; A. 3.5; P. 1.16—18; V. 1.9; L. l. 37; L. tr. $\frac{7}{1}$.
$\frac{}{6\frac{1}{2}}$

Compressed, elevated, dorsal profile from nape to dorsal strongly ascending and slightly arched, from nape to end of

snout convex. Height 2.3, 3.3 in length with caudal. Head 3.3, 4.7 in length with caudal. Eye 3, somewhat longer than snout, surrounded by a gelatinous membrane, situated somewhat below the dorsal profile, shorter than the flat interorbital space. Snout convex, obtuse. Mouth strongly arched, nearly reaching front-border of eye. No barbels. Origin of dorsal opposite to 10th scale of lateral line, above the middle of a line connecting end of snout and root of caudal, and about opposite to origin of ventrals, separated by 13 scales from occiput. Dorsal with a high scaly sheath, deeply concave, the anterior rays prolonged. Fourth osseous spine strongly serrated and much longer than head. Anal with a scaly sheath, deeply concave, third osseous spine strong, somewhat shorter than head. Pectorals and ventrals subequal. Ventrals separated by $4^1/_2$ scales from lateral line, just reaching anal. Pectorals longer than head without snout, reaching on ventrals. Caudal deeply forked, its lobes pointed, much longer than head. Least height of caudal peduncle twice in head, somewhat shorter than its own length. Most scales with numerous very fine undulating longitudinal lines. Silvery, back darkish. Fins with a blackish hue. Length over 350 mm.

Nomen indig.: Bulu-bulu (Malay. Banjermassin); Sanggan (Samarinda); Ikan Bangalan (Malay, Sumatra).

Habitat: Sumatra (Palembang, Lahat, Ringat!, Danau Sialong Lotong); Borneo (river Kapuas: Pontianak, Sintang, Smitau, Selimbouw, Danau Sriang, river Barito: Banjermassin, river Kahajan, river Mahakam: Samarinda!, and its affluent Bŏ, river Baram).

27. **Puntius waandersi** (Blkr.).

Systomus Waandersi Bleeker, Nat. Tijdschr. Ned. Indië XVI. 1858—1859, p. 358.
Systomus (*Systomus*) *Waandersi* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 359.
Puntius (*Puntius*) *Waandersi* Bleeker, Atl. Ichth. III. 1863, p. 110.
Barbus waandersi Günther, Cat. Brit. Mus. VII. 1868, p. 149.
Barbus Waandersi Vaillant, Nouv. Arch. Mus. Hist. Nat. (3) V. 1893, p. 83.
Barbus proctozysron Volz, Revue Suisse Zool. XII. 1904, p. 477 (nec Bleeker) [1].

1) This species is mentioned by Volz (Revue suisse de Zool. XII. 1904, p. 477) from river Kwantan, Sumatra. Fortunately he gives an ample description of his single example. This description shows, that he had not a specimen of *B. proctozysron* Blkr. but of *Puntius waandersi* Blkr. at his disposition. Volz states in his description: „Länge der Brustflosse gleich der grössten Korperhöhe oder gleich der Ventralflosse." This is an impossibility and probably a misprint for

D. 4.8; A. 3.5; P. 1.15—16; V. 2.8—9; L. l. 37; L. tr. $\frac{9}{1}$.
$7\frac{1}{2}$

Compressed, elevated, dorsal profile strongly ascending in a straight line from snout to dorsal with a slight concavity at the nape. Height 2.1—2.2, 2.7—3 in length with caudal. Head 3.2—3.6, 4.5—4.6 in length with caudal. Eye 2.8 to more than 3, longer than snout, surrounded by a gelatinous membrane, situated near the upper profile of the head, about equal to the flat or slightly excavated interorbital space. Snout very blunt. Mouth inferior, strongly arched, rather narrow. Maxillary reaching to below frontborder of eye or somewhat farther. No barbels. Praeorbital triangular, with the anterior and lower posterior corner rounded. Suborbital narrow. Origin of dorsal opposite to 11th or 12th scale of lateral line, conspicuously behind origin of ventrals, separated from the occiput by about 13 scales and a median plate corresponding to 2 or 3 scales, immediately before the dorsal spines; opposite to the middle of a line connecting frontborder of eye or middle of pupil and base of caudal. Dorsal concave, with a scaly sheath, the fourth spine and first rays being prolonged and longer than head. Fourth osseous spine strong and strongly serrated. Anal deeply concave, with a scaly sheath, the third osseous spine very strong and equal to head without snout or longer. Ventrals and pectorals equal. The ventrals separated by 5 or 6 scales from lateral line, the outer rays elongated, reaching on anal. Pectorals equal to head without snout or longer, reaching on ventrals. Caudal deeply forked, lobes pointed, much longer than head. Least height of caudal peduncle about twice or somewhat more in length of head, slightly shorter than its own length and surrounded by 18—20 scales. Scales partly with longitudinal irregular lines. Tubes of lateral line rather short. Silvery, back brownish. Fins with a more or less distinct blackish margin. Length over 300 mm.

„grösste Kopfhöhe", which is in accordance with the length of pectorals and ventrals of *Puntius waandersi*.

B. proctozysron Blkr. is also mentioned by v. MARTENS (Preuss. Exped. Ost-Asien I. Zoologie, 1876, p. 402), from Sintang, Borneo. He puts a query with the specific name. Now *B. proctozysron* Blkr. is very easy to recognise by its strongly dentated anal spine, a character unique among *Barbini*, as BLEEKER has shown. We suppose, that the definition of v. MARTENS, which he doubted himself, was erroneous. *B. proctozysron* is therefore till now only known from Siam.

Nom. indig.: Kepiat (Djambi); Tjipo (Palembang).

Habitat: Sumatra (Palembang!, Djambi!, Indragiri); Java (Ngawi); Borneo (river Kapuas; river Mahakam, Kota Bangun!).

28. **Puntius nini** n. sp.

D. 4.8; A. 3.6; P. 1.17; V. 1.9; L. l. 36 + 1 or 2 on caudal; L. tr. $\frac{9}{1}$.
$\frac{}{7\frac{1}{2}}$

Strongly compressed, oblong, very elevated. Dorsal profile ascending nearly in a straight line from nape to dorsal, head above eyes convex. Height 2, 2.6 in length with caudal. Head 3.5, about 4.5 in length with caudal. Eye large, 3.1—3.3 in head, situated for its greater part in the anterior half of the

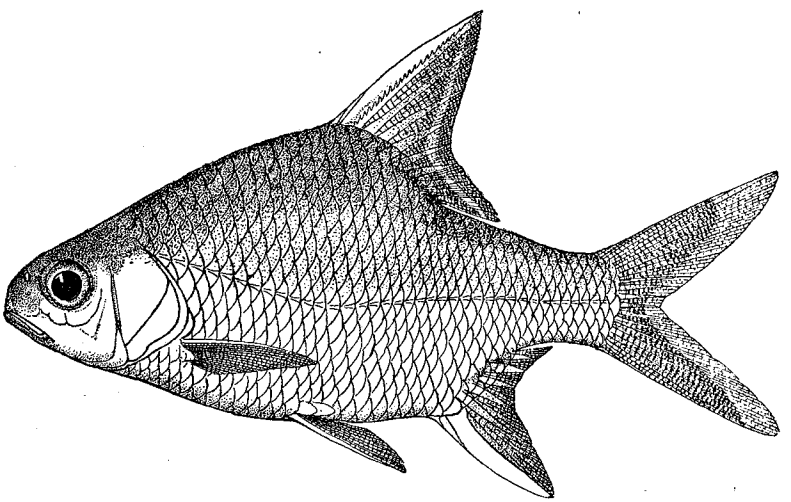


Fig. 75. *Puntius nini* n. sp. × 1/3.

head, rather near to the upper profile, surrounded by a gelatinous membrane, somewhat longer than snout, but shorter than somewhat convex interorbital space. Snout bluntly rounded, mouth somewhat inferior. No barbels. Origin of dorsal opposite to 10th or 11th scale of lateral line, slightly behind origin of ventrals, nearly opposite to the middle of a line connecting end of snout and base of caudal and separated by about 13 scales from occiput. Base of dorsal in a scaly sheath. Dorsal deeply emarginate, the fourth osseous spine strong, strongly denticulated behind, with its flexible part much longer than head. Base of anal in a scaly sheath. Anal deeply concave,

third spine strongly ossified, nearly as long as head. Pectorals and ventrals subequal. Ventrals separated by 5 or $5^1/_2$ scales from lateral line, the outer rays prolonged, reaching on anal. Pectorals slightly longer than head without snout, reaching on ventrals or nearly so. Caudal deeply emarginate, the lobes strongly diverging, about equal to head. Least height of caudal peduncle 1.8 in head, somewhat shorter than its length, surrounded by 20 scales. Most scales only with growth-lines, some of them with fine undulating lines at the hindborder. Tubes of lateral line short, mostly directed downwards. Silvery, upper half brown. A blackish band behind operculum, beginning at the nape. Vertical fins blackish. Length 277 mm. [Type of the species in the zoological Museum of Amsterdam].

Habitat: Borneo (Bunut!); collected by Dr. H. A. LORENTZ and named after his son.

29. **Puntius lawak** (Blkr.).

Systomus lawak Bleeker, Nat. Tijdschr. Ned. Indië IX. 1855, p. 411.
Systomus (*Systomus*) *lawak* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 361. — Atl. Ichth. III. 1863, p. 111.
Barbus lawak Günther, Cat. Brit. Mus. VII. 1868, p. 149.

D. 4.8; A. 3.7; P. 1.17; V. 1.9; L. l. 34 + 2; L. tr. $\frac{8}{1}$.
$\frac{}{6^1/_2}$

Compressed, very elevated, dorsal profile strongly ascending from front to dorsal and somewhat arched. Height 2,6, 3.3 in length with caudal. Head 3.9, 5 in length with caudal. Eye 4.3, surrounded by a gelatinous membrane, situated for its greater part in the anterior half of the head, slightly below the upper profile, about $^2/_3$ of length of snout and nearly twice in flat interorbital space. Mouth nearly terminal; no barbels. Origin of dorsal opposite to 11th scale of lateral line and to that of ventrals and to the middle of a line, connecting end of snout and base of caudal; separated by about 13 scales from occiput. Dorsal with a scaly sheath, deeply emarginate, the fourth spine, which is strongly ossified and strongly denticulated and the first divided ray are much prolonged and $^1/_4$ longer than the head. Anal with a scaly sheath, deeply emarginate, the first divided ray and the ossified third spine, which is very strong, prolonged, about $^4/_5$ length of head. Ventrals somewhat longer than pectorals, nearly reaching anal, separated by 4 scales from lateral line. Pectorals about $^3/_4$ length of head. Caudal

deeply emarginate, the lobes rounded and widely diverging, longer than head. Least height of caudal peduncle 1.8 in head, somewhat less than its own length, surrounded by 16 scales. Some of the scales with numerous short longitudinal striae at their hindborder. Tubes of lateral line short and partly directed downward. Silvery, upper surface dark. Dorsal and caudal darkish. Length 500 mm.

Nom. indig.: Lawak or Lalawak (Malay. Batavia).

Habitat: Sumatra (Djambi!); Java (Batavia, Surabaya); Riouw!.

Doubtful species.

30. **Puntius amblyrhynchus** (Blkr.).

Barbus obtusirostris Bleeker, Nat. Tijdschr. Ned. Indië XIII. 1857, p. 355 (nec C.V.).
Systomus (*Barbodes*) *obtusirostris* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 345.
Puntius (*Barbodes*) *amblyrhynchus* Bleeker, Atl. Ichth. III. 1863, p. 104.
Barbus amblyrhynchus Günther, Cat. Brit. Mus. VII. 1868, p. 126.

Founded on one specimen of 49 mm. length from Java (Tjampea). After having seen the type of the species in the British Museum, we are convinced that it is a young, monstruous example, with shortened snout, perhaps of *Puntius binotatus* (C.V.).

31. **Puntius bunter** (Blkr.) [1]).

Barbus bunter Bleeker, Nat. Tijdschr. Ned. Indië XIII. 1857, p. 150.
Systomus (*Barbodes*) *bunter* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 340.
Puntius (*Barbodes*) *bunter* Bleeker, Atl. Ichth. III. 1863, p. 101.

As the only specimen of 115 mm. length was lost, after a drawing of it was made, BLEEKER could dispose for his description only of this drawing, which, according to his own opinion, was not correct in every point.

32. **Puntius carassioides** (Heckel).

Barbus carassioides Heckel, Fische Syriens 1843, p. 29.
Systomus? (*Barbodes*) *carassioides* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 352.

HECKEL's description of a species, said to be from Borneo, characterized by „radio osseo in pinna dorsali et anali; margine postico serrato", is too short to make any definition possible.

1) By GÜNTHER: Cat. Brit. Mus. VII. 1868, p. 83, erroneously called "punter"; Bunter is the sundanese name for some species of *Puntius*.

33. Puntius vittatus (Day).

Barbus vittatus Day, Fishes of India 4⁰, 1878—1888, p. 582.

This species is mentioned by Karoli (Termeszetrajzi Füzetek V. 1882, p. 34) from "Palabuan, Java." This is probably erroneous, as this species is otherwise known only from the Indian Peninsula and Ceylon.

19. Balantiocheilus Bleeker.

(Bleeker, Nat. Tijdschr. Ned. Indië XX. 1859—1860, p. 430).

Oblong, compressed. Snout prominent. Mouth slightly inferior, horseshoe-shaped, upper jaw strongly protractile. Upper lip swollen and crenulated, its anterior part partly covered by an overhanging square fold of the snout, followed on each side by a lower fold. Lower lip formed by a broad, smooth fold of the skin, forming a pouch opening hindwards (Fig. 76 *l*).

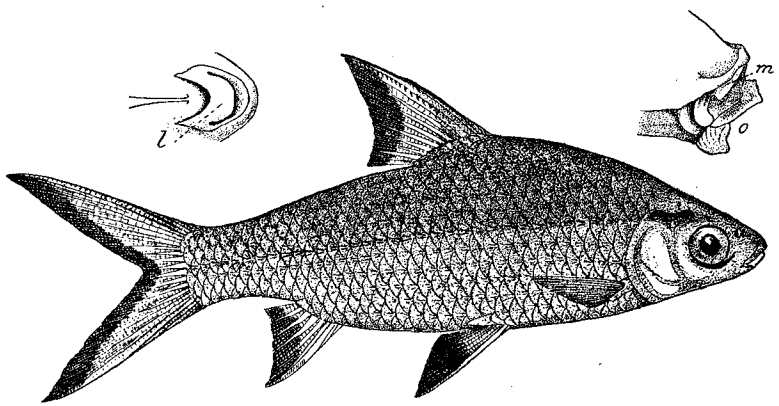


Fig. 76. *Balantiocheilus melanopterus* (Blkr.) × ½.
Left figure: mouth from below; right figure: snout, with the mouth protracted, *l* lower lip, *o* mouthopening, *m* maxillary.

No barbels. Suborbital bones narrow. Dorsal with 8—9 branched rays, with a scaly sheath at its base, its origin slightly behind that of ventrals; its fourth osseous spine strong and strongly denticulated behind. Anal with 5 branched rays. Scales moderate, with fine, converging longitudinal lines; lateral line complete, running in the middle of the tail, the tubes undivided. No sensory folds on head. Gillmembranes united to isthmus opposite middle of operculum. Pharyngeal teeth hooked and spoon-shaped 5.3.2—2.3.5.

Distribution: Indo-australian Archipelago (Sumatra and Borneo); Siam.

1. Balantiocheilus melanopterus (Blkr.).

Barbus melanopterus Bleeker, Nat. Tijdschr. Ned. Indië I. 1850, p. 11.
Systomus melanopterus Bleeker, Nat. Tijdschr. Ned. Indië II. 1851, p. 420.
Balantiocheilos melanopterus Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 301. — Atl. Ichth. III. 1863, p. 80.
Barbus melanopterus Günther, Cat. Brit. Mus. VII. 1868, p. 150.

D. 4.8—9; A. 3.5; P. 1.15; V. 2.8—9; L. l. 34—35; L. tr. $\frac{7\,(6\frac{1}{2})}{5\frac{1}{2}}$.

Elongate. Profile of back ascending, slightly arched, that of the head descending in a straight line. Height nearly 3, 3.7—3.8 in length with caudal. Head 3.7—3.8, 4.7—5.1 in length with caudal. Eye $3^1/_2$—4, less than snout and about $1^1/_2$ in convex interorbital space. Mouth protractile, slightly inferior, snout prominent. Upper lip swollen and crenulated, its anterior part partly covered by an overhanging square fold of the snout, followed on each side by a lower fold. Lower lip formed by a broad smooth fold of the skin, forming a pouch opening hindwards. No barbels. Origin of the dorsal slightly before the middle of a line connecting end of snout and base of caudal, above the 10th scale of the lateral line and 1 scale behind the origin of the ventrals, 12—13 scales before dorsal. Dorsal concave, its fourth spine slightly longer than head, strongly denticulated behind. Anal concave, its third spine somewhat thickened, longer than half head. Ventrals longer than pectorals, far distant from anus, separated by $3^1/_2$ scales from the 9th scale of lateral line. Pectorals small, $^3/_4$ length of head, not reaching ventrals. Caudal deeply forked, about $^1/_5$ longer than head. Least height of caudal peduncle more than its length, about twice in length of head, 16 scales round caudal peduncle, 7 of which above the lateral lines. Silvery, upper parts darker. Distal part of vertical and ventral fins deep black. Length 350 mm.

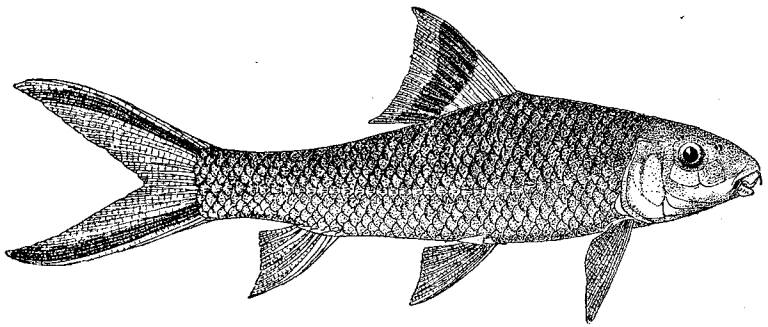
Nomen indig.: Pontong kanjot, Aru pendijem, Batang buro (Palembang); Ridi, Teridi angus (Djambi); Gatata (Mahakam).

Habitat: Sumatra (Palembang!, Djambi!, river Kwantan); Borneo (river Kapuas: Pontianak, Sintang; Lake Danau Sriang; river Barito: Banjermassin, river Kahajan; middle course of Mahakam river; Pengaron). — Siam.

20. **Barbichthys** Bleeker.

(Bleeker, Nat. Tijdschr. Ned. Indië XX. 1859—1860, p. 424).

Somewhat elongate and compressed. Back arched. Snout projecting beyond the angular mouth; with a free rostral fold. Upper lip thin but broadly pendulous and continuous with the lower lip, which is antero-posteriorly broad and reflected and laterally papillated. Laterally a triangular postlabial groove,



Fg. 77. *Barbichthys laevis* (C. V.) × 3/5.

behind the corner of the mouth, where the maxillary barbel originates. Upper jaw with a rather sharpe edge. Lower jaw blunt with a small symphysial knob. Behind it on each side a rather prominent high fold vertically projecting into the mouthopening. Opposite to it, on the palate, a series of parallel longitudinal

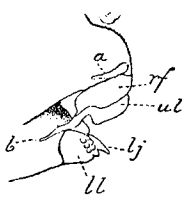


Fig. 78. Lateral view of anterior part of snout of *Barbichthys laevis* (C. V.).

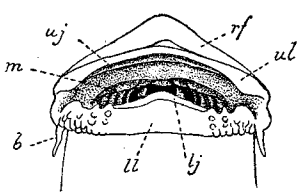


Fig. 79. Inferior view of opened mouth of *Barbichthys laevis* (C. V.).

a rostral, *b* maxillary barbels; *lj* lower jaw; *ll* lower lip; *m* mouthopening, with the longitudinal folds on the palate; *rf* rostral fold; *uj* upper jaw; *ul* upper lip.

folds. Four subequal small barbels, a rostral pair and one behind the corner of the mouth. Eye lateral, high, in the middle of the length of the head, with a free orbital margin. Praeorbital triangular, with an upward prolongation towards the

eye. Suborbitals broad, covering nearly the entire cheek. Dorsal short, without osseous ray and with 8 branched rays, its origin before that of ventrals. Anal short, with 5 branched rays. Ventrals and pectorals nearly equal in length, shorter than head. Caudal bifurcate. Scales of moderate size, lateral line running in the middle of the tail. Pharyngeal teeth 5.4.2—2.4.5. Branchial openings rather narrow, gillmembranes broadly united to isthmus.

Distribution: Fresh water of Indo-australian Archipelago (Sumatra, Java, Borneo). — Malacca, Indo-China.

1. Barbichthys laevis (C.V.)

Barbus laevis Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 192.
Dangila lipocheilus Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 232 (according to Bleeker).
Barbus brachynemus Bleeker, Verh. Batav. Gen. XXIII. (1849) 1850, Ichth. Midden en Oost-Java, p. 18.
Barbus gobioides Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 592.
Barbus laevis Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 447.
Barbus taeniopterus Bleeker, Nat. Tijdschr. Ned. Indië XIV. 1857, p. 475 (mutatio nominis specifici).
Barbichthys laevis Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 209. — Atl. Ichth. III. 1863, p. 49.
Barbichthys laevis Günther, Cat. Brit. Mus. VII. 1868, p. 158.
Barbichthys laevis var. *sumatranus* Volz, Revue Suisse de Zoologie XII. 1904, p. 478.

D. 3.8; A. 3.5; P. 1.15; V. 1.8; L. l. 37—39; L. tr. $\frac{6\frac{1}{2}}{1}$.

Height about $3^1/_2$ in length, 4.7—5 in length with caudal. Head 3.4—3.5, 4.7—4.8 in length with caudal. Eye 4, somewhat more than half snout and half interorbital space. Barbels subequal, about half eye. Origin of dorsal much nearer to snout than to root of caudal, separated by 12 scales from occiput, opposite to 8th scale of lateral line. Dorsal concave, its height less than length of head. Anal truncate, about equal to head without snout. Ventrals slightly shorter than pectorals, their origin separated by 4 scales from 11th or 12th scale of lateral line. Pectorals about $^1/_3$ shorter than head. Caudal bifurcate, the lobes pointed, longer than head. Least height of caudal peduncle less than its length, more than twice in head, surrounded by 16 scales. Silvery, back dark. A blackish intramarginal band on each caudal lobe, in young specimens a black band across the middle of the dorsal. Length 340 mm.

Nom. indig.: Ikan mendulah (Indragiri); Bentulu and Mentulu (Djambi); Battu-ulu (Lampong); Bokong or Borokong (river Bŏ); Wadon gunung (Malay. Batavia); Santran (Sundan.); Wader (Javan.).

Habitat: Sumatra (Lampong, Pangabuang, Lahat, Palembang!, river Kwantan: Ringat! — river Kampar: Gunung Sahilan!, Danau Sialong lotong in Indragiri, Djambi!); Java (Batavia, Tangerang, Rankasbetong, Lebak, Buitenzorg, Parongkalong, river Brantas, Surabaya, Gempol); Borneo (river Kapuas: Sintang!, Sebruang, Smitau, Knapei, Putus Sibau! — river Mahakam: Bunut! and its affluent river Bŏ, river Pengarong, affluent of river Barito. — Malacca, Siam, Indo-China.

21. Labeo Cuvier.

(Cuvier, Règne animal II. 1817, p. 194).

Oblong, more or less compressed. Snout broadly rounded or obtusely pointed, prominent, mostly covered with tubercles on pores and sometimes having a lateral lobe or projection, its anterior pendulous border forming an entire or superficially incised rostral fold. Mouth moderate or large, protractile, inferior. Lips thick, continuous, the upper and the lower one fringed, lobed or not. The lower lip is distinctly separated by a deep groove from isthmus or this postlabial groove is divided by a broad or narrow connection between isthmus and lip and therefore restricted to behind the lateral part of the lower lip or even to the corner of the mouth. Lower lip with an inner transverse fold. Jaws with a fleshy covering carrying a deciduous horny sheath. A pair of rostral and maxillary barbels, one of them may be absent. Eye with a free circular rim. Dorsal elongate, without osseous rays, commencing before ventrals and ending before or above anal, with more than 9 branched rays. Anal short, with 5 branched rays. Scales moderate or small. Lateral line running in the middle of the tail, sensory tubes undivided. No sensory folds on head. Gill-membranes broadly united with isthmus. Gillrakers usually short. Pharyngeal teeth in three series, hooked, 5.4.2—2.4.5.

Distribution: Freshwater of Indo-australian Archipelago (Sumatra, Java and Borneo); Southern Asia and Africa.

Synopsis of the subgenera.

1. Lower lip separated by a deep postlabial groove from isthmus. *Morulius* p. 210.
2. Lower lip connected by a broad or narrow bridge with the isthmus. . . . . *Labeo* s.str. p. 211.

1. Subgenus **Morulius** Bleeker.

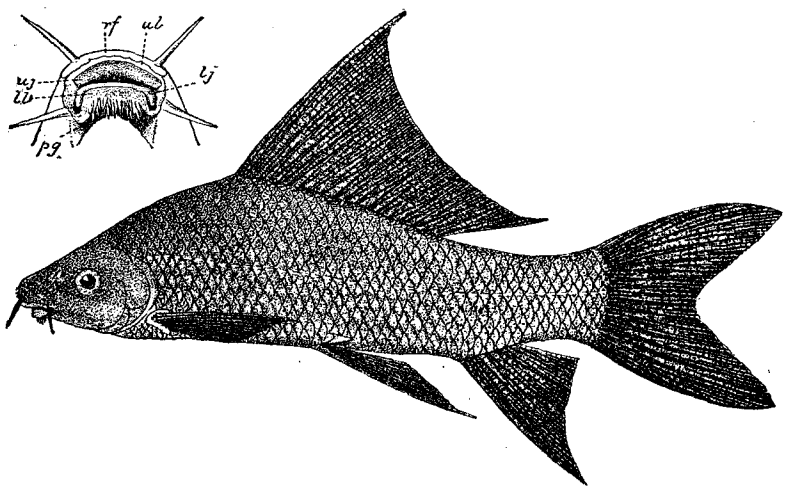


Fig. 80. *Labeo (Morulius) chrysophekadion* (Blkr.) × 1/4.
Upper figure: Mouth from below. *lj* lower jaw; *ll* lower lip; *pg* postlabial groove; *rf* rostral fold; *uj* upper jaw; *ul* upper lip.

1. **Labeo (Morulius) chrysophekadion** (Blkr.)

Rohita chrysophekadion Bleeker, Verh. Bat. Gen. XXIII. (1849) 1850, Bijdr. Ichth. Midden- en Oost-Java p. 20.
Rohita cyanomelas Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 597.
Rohita polyporos Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 519.
Rohita koilo-geneion Bleeker, Nat. Tijdschr. Ned. Indië XIII. 1857, p. 359.
Chrysophekadion polyporos Bleeker, Nat. Tijdschr. Ned. Indië XX. 1859—1860, p. 102.
Morulius chrysophekadion Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 188. — Atl. Ichth. III. 1863, p. 72.
Labeo chrysophekadion Günther, Cat. Brit. Mus. VII. 1868, p. 52.
Labeo chrysophekadion Volz, Zool. Jahrb. Abth. Syst. XIX. 1903, p. 396.

D. 3.15—18; A. $\frac{8}{3.5}$; P. 1.15—17; V. 1.8; L. l. 41—43; L. tr. $\frac{1}{8\frac{1}{2}—9\frac{1}{2}}$.

Height 2.6—3.5, 3.2—4.3 in length with caudal. Head 4.2—4.5, 5.4—5.7 in length with caudal. Eye 4.5—5, about in the

middle of the length of the head, twice in snout and 2.5 to more than 3 times in interorbital space. Snout obtusely pointed, prominent, with groups of larger and smaller pores from its tip to frontborder of eye. Mouth inferior, of moderate width. Lips moderately thick, fringed, with a very distinct inner fold above and below. Rostral barbels longer or shorter than maxillary barbels, not much shorter or longer than eye. Origin of dorsal opposite to 9th scale of lateral line, separated by about 25 scales from occiput. Dorsal concave, the anterior rays much longer than head. Anal with the anterior rays strongly prolonged, reaching on caudal, its height less than that of dorsal, but longer than head, its origin opposite to 27th—28th scale of lateral line and behind dorsal. Ventrals and pectorals subequal or the ventrals much longer and reaching with the outer prolonged rays far on anal. Origin of ventrals opposite to 14th scale of lateral line and the 4th branched dorsal ray, separated by 6 scales from lateral line. Pectorals longer than head. Caudal deeply emarginate, lobes pointed or rounded, much longer than head. Least height of caudal peduncle 1.6—1.7 in length of head, about equal to length of the peduncle, surrounded by 21 or 22 scales. Dark violet, each scale with a round golden spot, more or less conspicuous in preserved specimens. Fins black. Length 600 mm.

Nom. indig.: Millem (Malay, Batavia); Arenjan (Sundan.); Sihitam or ikan itam (Sumatra).

Habitat: Sumatra (Muarah-Kompeh, Palembang!, river Lematang ilir: Benakat, river Kwantan, river Batang Hari: Djambi!); Java (Batavia, Bekassi, Krawang, Tjampea, Parongkalong, Tjikao, Surabaya, Gempol); Borneo (river Kapuas). — Siam.

2. Subgenus **Labeo** Cuv. s. str.

Key to the indo-australian species.

1. Linea lateralis 40 or more.
   a. Snout with a lateral lobe; 4 barbels . . . . *L. (L.) erythropterus* p. 212.
   b. Snout without lateral lobe, 2 rostral barbels only. . . . . *L. (L.) molitorella* p. 213.
2. Linea lateralis less than 40.
   a. Snout with a lateral lobe . . . . . *L. (L.) rohitoides* p. 214.
   b. Snout without a lateral lobe . . . . . *L. (L.) pleurotaenia* p. 215.

1. Labeo (Labeo) erythropterus C.V.

Labeo erythropterus Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 354.
Labeo erythropterus Bleeker, Nat. Tijdschr. Ned. Indië XIII. 1857, p. 360.
Lobocheilos lucas Bleeker, Nat. Tijdschr. Ned. Indië XIII. 1857, p. 362.
Labeo (Diplocheilos) erythropterus Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 135. — Atl. Ichth. III. 1863, p. 52.
Labeo (Diplocheilos) lucas Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 137. — Atl. Ichth. III. 1863, p. 53.
Labeo erythropterus Günther, Cat. Brit. Mus. VII. 1868, p. 56.

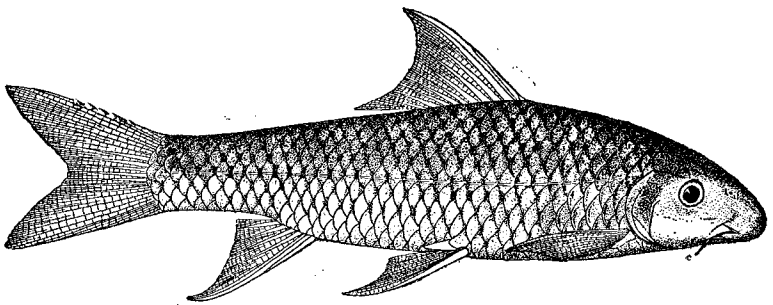


Fig. 81. *Labeo rohitoides* (Blkr.). × 2/5.

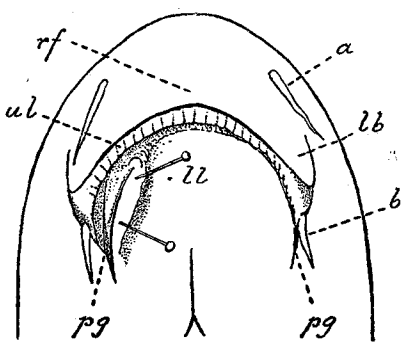


Fig. 82. Ventral surface of head of *Labeo rohitoides* (Blkr.).

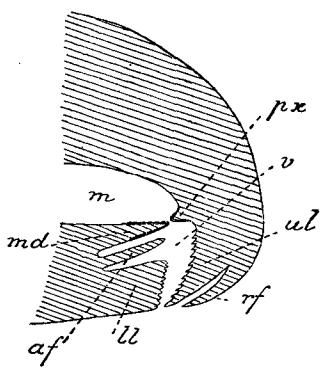


Fig. 83. Scheme of median section through region of mouth of *Labeo*.

a rostral barbel; *af* transverse fold of lower lip; *b* maxillary barbel; *lb* lateral lobe of rostral fold; *ll* lower lip; *m* mouth; *md* mandible; *pg* postlabial groove; *px* intermaxillary with horny covering; *rf* rostral fold; *ul* upper lip; *v* vestibulum oris.

D. 3.10—12; A. 3.5; P. 1.14—15; V. 1.8; L. l. 41—43; L. tr. $\frac{7\frac{1}{2}—8}{\frac{1}{7}}$.

Height $3^1/_6$, 4—5 in length with caudal; head $3^3/_4$—$4^1/_2$, $4^3/_4$—6 in length with caudal. Eye 3—4, after GÜNTHER not so large as a

scale, situated in or (in adult examples) behind the middle of the length of the head, shorter or much shorter than snout, $1^1/_3$—$2^1/_3$ times in interorbital space. Snout obtuse, much projecting beyond the lower jaw, with a very distinct lateral lobe; a deep groove on each side of the snout, which is provided above and on the sides with numerous conspicuous pores. Maxillary and rostral barbels subequal, small, the latter often rudimentary. Mouth broad; lips thick, continuous, not fringed, with an inner fold in their entire circumference, equally developed on the lower and upper lips. Dorsal emarginate, its height 1—$1^1/_4$ in height of body, its origin separated by 16 scales from occiput. Anal somewhat or slightly emarginate, not much lower than dorsal. Ventrals and pectorals subequal, $5^1/_3$ to more than 6 in total length; ventrals not reaching anal. Caudal deeply incised, the lobes pointed, longer than head. Least height of caudal peduncle, measured by us in a small specimen, 1.8 in head, somewhat shorter than length of peduncle, surrounded by 18 scales. Coloration uniform, in youth there seems to be a diffuse black blotch on the base of caudal. [After BLEEKER and GÜNTHER. Only a small example in bad state seen by us]. Length 275 mm. and more.

Nom. indig.: Arengan (Sundan.); Lucas or Wadon Gunung (Malay. Batavia).

Habitat: Java (Batavia, Lebak, Parongkalong).

2. Labeo (Labeo) molitorella (C.V.).

Leuciscus molitorella Cuvier & Valenciennes, Hist. Nat. Poissons XVII. 1844, p. 359.
Leuciscus molitorella Richardson, Report 15th meeting British Association, 1846, p. 296.

D. 3.13; A. 3.5; P. 16; V. 1.8; L. l. 41; L. tr. $\frac{7}{1}$.
$\frac{}{8}$

Oval, compressed, dorsal profile arched. Height 2.8, 3.8 in length with caudal. Head 5.2, 6.9 in length with caudal. Eye 4, much shorter than snout, which is not much shorter than the postorbital part of the head, somewhat more than twice in the flattened interorbital space. Snout blunt, mouthopening transverse, inferior. Upper lip lobate; postlabial groove restricted to a short space beyond the corner of the mouth. Only a pair of rostral barbels developed, their length about equal to half diameter of eye. Origin of dorsal opposite to 10th or 11th scale of lateral line and to the end of the second $^1/_5$ of a line

connecting end of snout and base of caudal, separated by 14 scales from occiput. Dorsal somewhat emarginate, but with the last ray prolonged. Third spine rather weak, its total length nearly $^1/_3$ more than length of head. Anal emarginate, the anterior rays prolonged, nearly equal to length of head and reaching outer rays of caudal; its origin opposite to 28th or 29th scale of lateral line. Ventrals $^1/_4$ longer than head, the outer rays prolonged, nearly reaching anus; their origin opposite to the 15th or 16th scale of lateral line, from which they are separated by $5^1/_2$ scales and opposite to the 6th branched ray of dorsal or nearly to the middle of that fin. Pectorals falciform, longer than head. Caudal deeply bifurcate, the lobes pointed, much longer than head. Least height of caudal peduncle nearly equal to its own length, $1^1/_2$ times in that of head, surrounded by about 19 scales. Silvery, back darker. Twelve to fifteen scales above the pectoral, arranged in 2—3 vertical rows, with a more or less extensive brown blotch. Length of specimen described 432 mm.

Nom. indig.: Tiam.

Habitat: Sumatra (Kota Radja, chinese fishpond !). — China.

We suppose that our specimen is identical with the species scantily described by VALENCIENNES and by RICHARDSON after drawings only. It has probably been introduced by Chinese.

3. **Labeo (Labeo) rohitoides** (Blkr.) [Fig. 81, 82, p. 212].

Lobocheilos rohitoides Bleeker, Nat. Tijdschr. Ned. Indië XIII. 1857, p. 363.
Labeo (Diplocheilos) rohitoides Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 139. — Atl. Ichth. III. 1863, p. 53.
Osteochilus Jentinkii Popta, Notes Leyden Mus. XXIV. 1902—1904, p. 194. — Ibid. XXVII. 1906, p. 91.
Labeo (Diplocheilus) rohitoides Max Weber & de Beaufort, in: Maass "Durch Zentral-Sumatra" II. 1912, Fische p. 524.

D. 3.10—11; A. 3.5; P. 1.14—15; V. 1.8; L. l. 33; L. tr. $\frac{5\frac{1}{2}}{6\frac{1}{2}}$.

Height 3.5, 4.5 in length with caudal; head 4.5, 5.8 in length with caudal. Eye 4, twice in snout, 2.4 in interorbital space. Snout very blunt, rounded and prominent, with numerous pores of different size; its pendulous part with a lateral lobe, covering upper lip, which has a series of superficial indentations and which is continuous with the very thick, swollen and broadly fringed lower lip. A deep groove on each side of the snout,

containing the hindwards prolonged commissure of the lips. Rostral and maxillary barbels smaller than eye. Origin of dorsal opposite to 8th scale of lateral line and separated by 10 scales from occiput. Dorsal emarginate, the anterior prolonged rays longer than head. Anal with the anterior rays prolonged, reaching base of caudal and equalling the height of dorsal; its origin opposite to 22nd scale of lateral line, far behind dorsal. Ventrals and pectorals subequal; ventrals reaching anus, their origin separated by $3^1/_2$ series of scales from the 11th scale of lateral line and opposite to 3rd branched ray of dorsal. Pectorals equal to head. Caudal deeply emarginate, longer than head. Least height of caudal peduncle 1.7 in length of head, and 1.3 in length of peduncle; surrounded by 16 scales. After BLEEKER a diffuse brownish band from head to caudal. [Description made after our specimen of about 260 mm., the largest specimen known; the type of *Osteochilus Jentinkii* Popta in the Leiden Museum, seen by us].

Nom. indig.: Lucas (Malay. Batavia); Tĕbulit (Bongan).

Habitat: Sumatra (Sidjungdjung!); Java (Batavia); Borneo (river Bongan, one of the tributaries of the river Kapuas!).

4. Labeo (Labeo) pleurotaenia (Blkr.).

Lobocheilos pleurotaenia Bleeker, Nat. Tijdschr. Ned. Indië IX. 1855, p. 267.
Diplocheilichthys pleurotaenia Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 143. — Atl. Ichth. III. 1863, p. 55.
Labeo pleurotaenia Günther, Cat. Brit. Mus. VII. 1868, p. 58 (sine synon.).

D. 3.10—11; A. 3.5; P. 1.14—15; V. 1.8; L. l. 34; L. tr. $\frac{5\frac{1}{2}—6}{\frac{1}{6}}$.

Height about 3.8, about 5 in length with caudal; head $3^3/_5—4^3/_4$, nearly 5—6 in length with caudal. Eye about 3—4, in adult specimens much shorter than snout, $1^1/_4—2$ in interorbital space. Snout much swollen, prominent, anteriorly with numerous conspicuous pores. Its pendulous part, without a lateral lobe, covering the smooth upper lip, which is continuous with the thick lower lip, provided with only one series of very small papillae [1]). Maxillary barbels much longer than rostral ones, about equal to eye. Dorsal emarginate, about equal to

1) This is according to BLEEKER's description of this species; in his "Prodromus" he says of the genus *Diplocheilichthys*, which is made for the present species: "labium inferius crenulatum" but, on the contrary in his "Atlas Ichth." "labia nec papillata nec fimbriata".

or less than height of body, separated by 11—12 scales from occiput; its origin opposite to 8th scale of lateral line. Anal slightly or much emarginate, much lower than dorsal or equal to it. Pectorals and ventrals subequal, about equal to length of head. Ventrals nearly reaching anal or not so far. Caudal deeply incised, the lobes acute, longer than head. A diffuse brownish band from head to caudal; young examples with the band inconspicuous but with a round brownish blotch at the end of the lateral line. [Specimens of BLEEKER's collection and of the Dutch Borneo expedition in the Leiden Museum seen by us]. Length 216 mm.

Habitat: Sumatra (Lahat, Upper Langkat (Volz)); Borneo (middle and upper part of river Kapuas!). — Malacca.

22. Schismatorhynchus Bleeker.

(BLEEKER, Natuurk. Tijdschr. Ned. Indië IX. 1855, p. 258 and 269).

Elongate, compressed. Snout divided by a horizontal groove in a thick prominent upper and a much longer and more prominent lower part, both provided with large pores and tubercles. Mouth inferior, large and crescentic. The pendulous

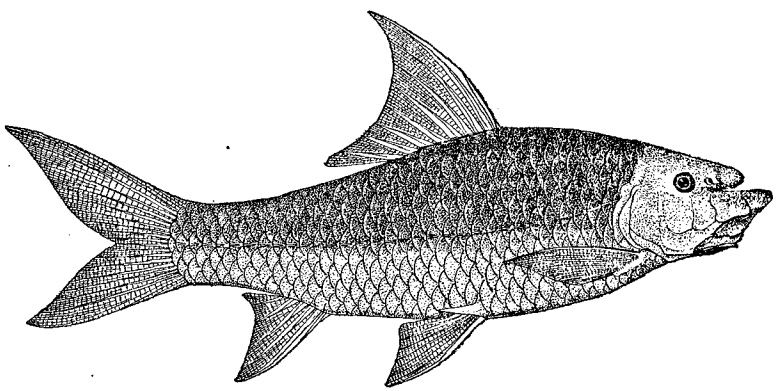


Fig. 84. *Schismatorhynchus heterorhynchus* (Blkr.) × 1/3.

rostral fold entire, the upper lip adnate to and slightly pendulous from the upper jaw, and prolonged hindwards. Lower jaw very deep from outwards to inwards and covered with a horny sheath; exteriorly truncate, interiorly deeply emarginate in the middle, so that on each side a conical process protrudes into the cavity of the mouth. Corner of mouth prolonged as a kind of gutter, anteriorly formed by a prolongation of the

upper lip, posteriorly by a prolongation of the soft covering of the jaw. Lower lip reflected, not continuous with the upper lip and separated from the last named prolongation by a longitudinal postlabial groove, which is divided by a longitudinal fleshy frenulum in a median and a lateral part, the last of which contains the maxillary barbel and the gutter-like prolongation. A pair of rostral barbels. Eye with a free orbital margin. Dorsal without osseous ray and with 8 branched rays.

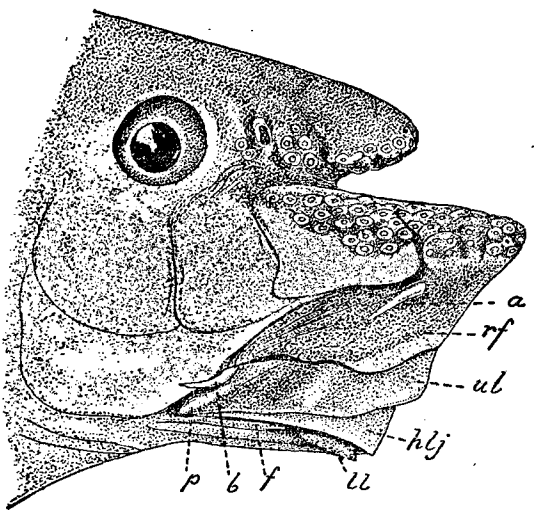


Fig. 85. Lateral view of head of *Schismatorhynchus heterorhynchus* (Blkr.) × 1½.

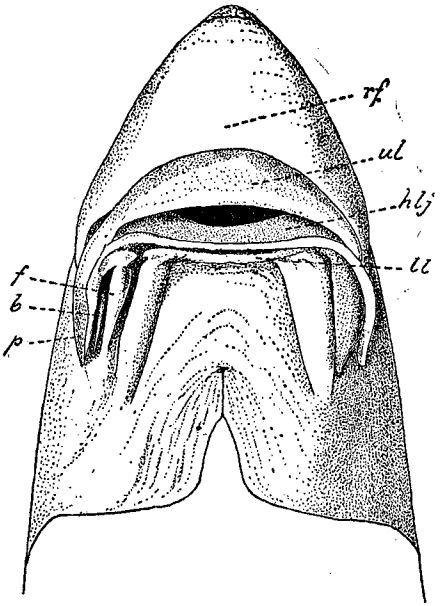


Fig. 86. Lower surface of head of *Schismatorhynchus heterorhynchus* (Blkr.) × 1½.

a rostral barbel; *b* maxillary barbel, in fig. 85 exposed, in fig. 86 in natural position; *f* frenulum; *hlj* horny layer of lower jaw; *ll* lower lip; *p* prolongation of the lip; *rf* rostral fold; *ul* upper lip.

Its origin in advance of that of the ventrals. Anal short, with 5 branched rays. Caudal bifurcate. Pectorals subhorizontal. Scales large; lateral line straight, running in the middle of the tail. Branchial openings rather wide. Gillmembranes united with isthmus. Pharyngeal teeth 5.4.2—2.4.5, obliquely truncate.

Distribution: Fresh water of Indo-australian Archipelago (Sumatra and Borneo); perhaps also represented on the Indian continent.

1. Schismatorhynchus heterorhynchus (Blkr.).

Lobocheilos heterorhynchos Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 524.
Schismatorhynchus lobocheilioides Bleeker, Nat. Tijdschr. Ned. Indië IX. 1855, p. 260.
Schismatorhynchos heterorhynchos Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 131.
Schismatorhynchus heterorhynchus Bleeker, Atl. Ichth. III. 1863, p. 50.
Tylognathus heterorhynchus Günther, Cat. Brit. Mus. VII. 1868, p. 67.
Tylognathus heterorhynchus Vaillant, Notes Leyden Mus. XXIV. 1902, p. 90.
Tylognathus heterorhynchus Popta, Notes Leyden Mus. XXVII. 1906, p. 112.

D. 3.8; A. 3.5; P. 1.16—17; V. 1.8; L. l. 33; L. tr. $\frac{5\frac{1}{2}}{1}$.
$\frac{}{5\frac{1}{2}}$

Height 3.3, 4.3 in length with caudal. Head 4, 5.3 in length with caudal. Eye 5.3, nearly thrice in snout and nearly twice in interorbital space. Rostral barbels shorter than eye, maxillary ones somewhat longer. Origin of dorsal opposite to 9th scale of lateral line, separated by 11 scales from occiput. Dorsal deeply emarginate, the height of the anterior prolonged rays about equal to height of body. Anal with the anterior rays prolonged, much shorter than head; its origin opposite to 21st scale of lateral line. Ventrals and pectorals subequal. Origin of ventrals opposite to 3rd branched ray of dorsal and separated by about $3^1/_2$ scales from 11th scale of the lateral line. Pectorals shorter than head. Caudal deeply forked, the upper lobe produced, about equal to height of body. Least height of caudal peduncle more than 1.7 in length of head, somewhat less than its own length, surrounded by 16 scales. An indistinct broad dark band running along the lateral line. Fin-membranes dark violet. Length 283 mm. [After a specimen of 283 mm.].

Nom. indig.: Pasă (river Bongan).

Habitat: Sumatra (Solok, Lahat); Borneo (river Kapuas: Sintang, mouth of Raun, river Sibau!, river Bongan).

23. Tylognathus Heckel p. p.

(Heckel, Fische Syriens, 1843, p. 37. in Russeggers Reisen Bd. I. Th. 2, p. 1027).
(*Lobocheilus* Bleeker, Nat. Tijdschr. Ned. Indië XX. 1859—1860, p. 424).

Elongate, compressed. Dorsal and ventral profile slightly convex. Snout obtusely rounded, prominent, with or without pores and tubercles and without a free movable lobe. Mouth inferior, crescentic; the pendulous rostral fold entire. Upper lip entire, adnate to the upper jaw, which has a soft inner fold covered with a deciduous horny layer. The upper lip is con-

tinued round the corner of the mouth. Postlabial groove represented laterally only by a deep longitudinal groove, which

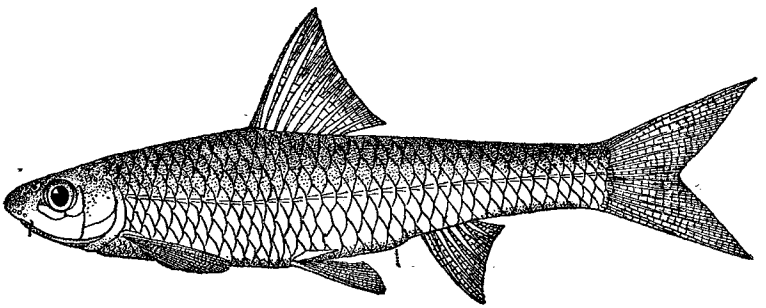


Fig. 87. *Tylognathus falcifer* (C. V.) $\times$ $^2/_3$

divides the lower lip into a thick, fleshy superficial part and a narrow deeper part, which is continued round the corner of the mouth into the upper lip. Lower jaw with a thick fleshy covering, carrying a deciduous horny sheath. A pair of rostral barbels present or absent. The pair of maxillary barbels hidden in a deep groove behind the angle of the mouth. Eye with a free orbital margin. Dorsal without osseous ray, with 8—9 branched rays; its origin somewhat in advance of the ventrals. Anal short, with 5 branched rays. Pectorals short, subhorizontal. Caudal forked. Scales rather large. Lateral line straight, running in the middle of the tail. Pharyngeal teeth 5.4.2—2.4.5, uncinate. Branchial opening rather ample, gillmembranes united with isthmus.

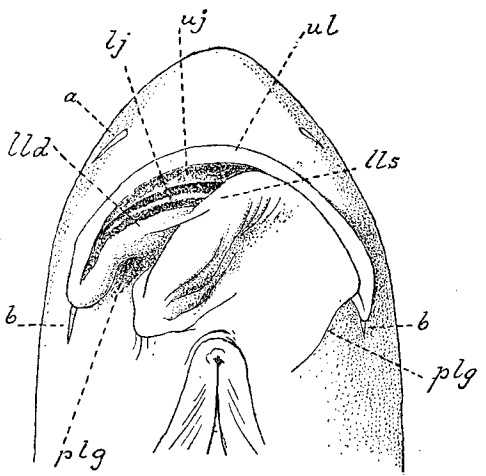


Fig. 88. Lower surface of head of *Tylognathus falcifer* (C.V.) $\times$ $3^1/_2$. *a* rostral, *b* maxillary barbel; *lj* lower jaw with horny sheath; *lld* deep-, *lls* superficial part of lower lip; *plg* postlabial groove; *uj* upper jaw with horny layer; *ul* upper lip.

Distribution: Fresh water of Indo-australian Archipelago (Sumatra, Java, Borneo) and Continental Asia.

Key to the indo-australian species of *Tylognathus*.

I. Two barbels only.
  1. Least height of caudal peduncle surrounded by 12 scales . . . . . *T. hispidus* p. 220.
  2. Least height of caudal peduncle surrounded by 16 scales.
    a. Pectorals equal to or longer than head, linea lateralis 34—35 . . . . . *T. bo* p. 221.
    b. Pectorals shorter than head, linea lateralis 37—38 . . . . . *T. kajanensis* p. 221.

II. Four barbels.
  1. $4^1/_2$ scales above lateral line . . . . . *T. lehat* p. 222.
  2. $5^1/_2$ scales above lateral line.
    a. Length of head less than height of body. . . *T. falcifer* p. 222.
    b. Length of head equal to height of body . . . *T. schwanefeldi* p. 223.

Doubtful species . . . . . *T. hasselti* p. 224.

1. Tylognathus hispidus (C. V.).

Labeo hispidus Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 356.
Chondrostoma lipocheilos Cuvier & Valenciennes, Hist. Nat. Poissons XVII. 1844, p. 400.
Gobio javanicus Bleeker, Nat. Tijdschr. Ned. Indië XIII. 1857, p. 358.
Lobocheilus (*Gobionichthys*) *javanicus* Bleeker, Acta Soc. Sc. Indo-Neerl. VI. 1859, Enumeratio pisc. p. 145.
Lobocheilus (*Gobionichthys*) *lipocheilus* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 154. — Atl. Ichth. III. 1863, p. 59.
Tylognathus hispidus Günther, Cat. Brit. Mus. VII. 1868, p. 66.
Lobocheilos hispidus Fowler, Proc. Acad. Nat. Sc. Philadelphia (2) LVII. 1905, p. 483.
Tylognathus hispidus Popta, Notes Leyden Mus. XXVII. 1906, p. 108.

D. 4.8—9; A. 3.5; P. 1.14—15; V. 2.8; L. l. 35—36; L. tr. $\frac{5\frac{1}{2}}{1}$.
$\frac{}{5\frac{1}{2}}$

Height $3^3/_4$—$4^5/_7$, 5 to more than 6 in length with caudal. Head 4—$5^1/_3$, more than 5—$7^1/_4$ in length with caudal. Eye more than 3 to more than 4, its centre situated somewhat behind the middle of the length of the head. Structure of mouth and of snout as in Fig. 88, but having two maxillary barbels only. Origin of dorsal in advance of that of the ventrals, opposite to the 10th scale of the lateral line. Anterior dorsal rays more or less prolonged in adult examples. Anal more or less emarginate, its height less than that of dorsal. Pectorals and ventrals subequal, 6—$6^1/_3$ in total length. Caudal deeply forked. There are 3—4 longitudinal rows of scales between

the lateral line and the root of the ventral fin. Colour silvery, dark above. The young ones with a black longitudinal lateral band and a dorsal one, which disappears in old specimens. Length 300 mm.

Nom. indig.: Wadong gunung (Malay. Batavia); Lehat, Millang (Sundan.); Ahang, Modjok (Bongan).

Habitat: Java (Batavia, Buitenzorg); Borneo (river Kapuas: Sintang, mouth of Raun, Upper-Sibau and river Bongan; river Mahakam: river Bŏ and river Bluu; river Baram).

2. Tylognathus bo Popta.

Tylognathus bo Popta, Notes Leyden Mus. XXIV. 1902—1904, p. 199. — Ibid. XXVII. 1906, p. 116.

D. 3.8; A. 3.5; P. 1.14—16; V. 1.8; L. l. 34—35; L. tr. $\frac{5\frac{1}{2}}{1}$.
$\frac{}{5\frac{1}{2}}$

Height $3^2/_3$—4, almost 5 to $5^1/_2$ in length with caudal. Head $4^2/_5$—$4^8/_9$, 6—$6^1/_2$ in length with caudal. Eye $4^5/_9$—$5^2/_7$, $1^3/_5$—$2^2/_5$ in snout, 2—$3^1/_6$ in interorbital space. Two maxillary barbels, $^4/_5$ of the length of the eye. No rostral barbels. Origin of dorsal opposite to 10th scale of lateral line, separated by 11 scales from occiput. Dorsal emarginate, its height equal to that of the body or a little less. Origin of anal opposite to 21st or 22nd scale of lateral line. Height of anal more or less than that of ventrals, which are somewhat shorter than pectorals. Origin of ventrals separated by 3 scales from 11th or 12th scale of lateral line. Pectorals 4—$4^1/_2$ in length, equal to or longer than head. Caudal bifurcate and much longer than height of body. Least height of caudal peduncle $1^2/_5$—$1^4/_5$ in length of head, surrounded by 16 scales. Brownish above, lighter below. Length 294 mm. [Type seen by us in the Leiden Museum].

Habitat: Borneo (river Bŏ!).

3. Tylognathus kajanensis Popta.

Tylognathus kajanensis Popta, Notes Leyden Mus. XXIV. 1902—1904, p. 198. — Ibid. XXVII. 1906, p. 112.

D. 3.8; A. 3.5; P. 1.13—15; V. 1.8; L. l. 37—38; L. tr. $\frac{5\frac{1}{2}}{1}$.
$\frac{}{5—5\frac{1}{2}}$

Height equal to head, $4^1/_3$—$4^5/_7$, $5^3/_5$—6 in length with caudal. Eye 5, slightly more than twice in snout, and $2^1/_9$—$2^5/_{11}$ in interorbital space. Only a pair of maxillary barbels present,

$^5/_7$ length of eye. Origin of dorsal opposite to 11th scale of lateral line, separated by 11 scales from occiput. Dorsal slightly emarginate, as high as body. Anal beginning opposite to 24th scale of lateral line, its height is equal to the length of pectorals and ventrals. Origin of ventrals separated by $2^1/_2$—3 scales from the 13th scale of lateral line. Pectorals 5—$5^2/_7$ in length. Caudal bifurcate, much longer than head. Caudal peduncle surrounded by 16 scales. Brown above, lighter below. There is a dark brown spot on the caudal peduncle. Length 192 mm.

Nom. indig.: Modjok (Kajan); Seluang (Djambi).

Habitat: Sumatra (Djambi!); Borneo (river Kajan).

4. Tylognathus lehat (Blkr.).

Lobocheilos (*Lobocheilos*) *lehat* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 152. — Atl. Ichth. III. 1863, p. 58.

Tylognathus lehat Günther, Cat. Brit. Mus. VII. 1868, p. 66.

D. 3.8—9; A. 3.5; P. 1.15; V. 1.8; L. l. 32—34; L. tr. $\frac{4^1/_2}{4^1/_2}$.

Height $3^3/_4$—4. Head more than 4 to 5. Eye more than 3 to $4^1/_2$, situated somewhat behind the middle of the length of the head, twice in snout. Barbels 4, very small. Origin of dorsal in advance of that of ventrals, opposite to 9th or 10th scale of lateral line and separated by 9 scales from occiput. Anterior rays scarcely prolonged in adult examples. Pectorals and ventrals subequal, $5^3/_5$ to more than six times in total length, somewhat shorter than head. Ventrals reaching anus, their origin separated by $2^1/_2$ scales from 11th scale of lateral line. Pectorals not reaching ventrals. Caudal forked. Least height of caudal peduncle 1.6 in its own length; surrounded by 12 scales. Length 225 mm. [After specimens in the British Museum seen by us].

Nom. indig.: Lehat, Millang (Sundan.).

Habitat: Java (Parongkalong).

5. Tylognathus falcifer (C.V.). [Fig. 87 and 88, pag. 219].

Labeo falcifer Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 358.

Lobocheilos falcifer Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 522.

Gobio microcephalus Bleeker, Nat. Tijdschr. Ned. Indië XIII. 1857, p. 357.

Lobocheilos (*Lobocheilos*) *falcifer* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 148. — Atl. Ichth. III. 1863, p. 56.

Lobocheilos (*Gobionichthys*) *microcephalus* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 156. — Atl. Ichth. III. 1863, p. 60.

Tylognathus falcifer Günther, Cat. Brit. Mus. VII. 1868, p. 65.

D. 3.8—9; A. 3.5; P. 1.14—15; V. 1.8; L. l. 33—35; L. tr. $\frac{5\frac{1}{2}}{5-5\frac{1}{2}}$.

Height 3.3—3.9, 4.3 to more than 5 in length with caudal; head $4^2/_3$—$5^1/_5$, nearly 6—7 in length with caudal. Eye 3—$4^1/_2$, its centre situated somewhat behind the middle of the length of the head, $1^2/_5$—$2^1/_2$ in interorbital space, in young specimens not, in older ones much shorter than snout. Snout obtusely pointed, projecting beyond the lower jaw, porous. Barbels four, very small. Origin of dorsal in advance of that of ventrals, opposite to 10th or 11th scale of lateral line, separated by 11—12 scales from occiput. Dorsal deeply emarginate, anterior dorsal rays more or less prolonged in adult examples. Origin of anal opposite to 22nd or 23rd scale of lateral line. Anal more or less emarginate, much lower than dorsal. Ventrals and pectorals subequal, shorter than head. Ventrals opposite to 12th scale of lateral line and to third branched ray of dorsal. There are three rows of scales between the lateral line and the root of the ventral fin. Caudal deeply forked. Colour uniform, an indication of a faint lateral brown band in young specimens. Length 335 mm.

Nom. indig.: Lehat, Millang (Malay. Batavia, Sundan.); Udjah (Sundan.).

Habitat: Sumatra (lake Manindjau!); Java (Batavia, Rankasbetong, Lebak, Tjampea, Buitenzorg, Sadjira, Sading, Tjandjur, Parongkalong, Kuningan, Ngantang); Borneo (river Kapuas).

6. **Tylognathus schwanefeldi** (Blkr.).

Lobocheilos Schwanefeldii Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 523.
Lobocheilos (*Lobocheilos*) *Schwanefeldi* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 150. — Atl. Ichth. III. 1863, p. 57.
Tylognathus schwanefeldii Günther, Cat. Brit. Mus. VII. 1868, p. 66.

If this is really a distinct species, it differs, according to BLEEKER and GÜNTHER, from *T. falcifer* by having the height of the body equal to the length of the head. According to BLEEKER the height of the head goes $1^2/_5$—$1^3/_7$ in its length in *T. schwanefeldi*, and $1^1/_4$ to scarcely more than once in *T. falcifer*. Moreover *T. schwanefeldi* is said to have a light yellowich narrow lateral band running above the lateral line.

Specimens of both species of BLEEKER's collection in our possession, are in too bad state to controle the above statements.

Nom. indig.: Lahat, Millang (Sundan.).

Habitat: Sumatra (Solok, Lahat); Java (Lebak, Parongkalong).

Doubtful species.

7. Tylognathus hasselti (Blkr.)

Barbus Hasseltii Bleeker, Nat. Tijdschr. Ned. Indië XIII. 1857, p. 355.
Lobocheilos (*Lobocheilos*?) *Hasseltii* Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 153.

This species was founded on a bad drawing only. Afterwards (Atl. Ichth. III. 1863, p. 56) the author says about it: "Il m'a paru que mon *Lobocheilos? Hasselti* est d'un genre différent."

24. Gyrinocheilus Vaillant.

(VAILLANT, Comptes rendus Acad. sc. Paris 1902, p. 1702).

Elongate. Head and body ventrally flattened. Head conical,

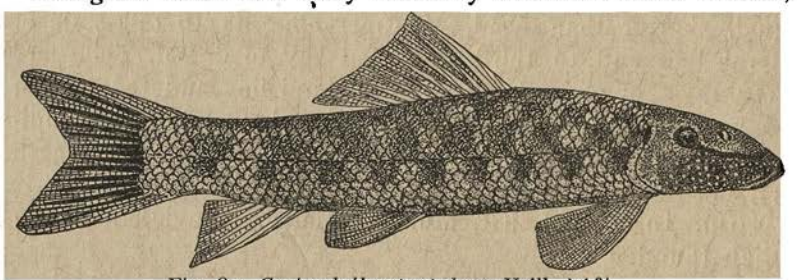


Fig. 89. *Gyrinocheilus pustulosus* Vaill. × 3/4.

laterally with several irregular rows of cutaneous pores. Snout prominent, pointed, anteriorly superiorly with a furrow, which is continued along its lower surface round the corner of the mouth to the postlabial groove. No rostral fold. Upperlip thick, mesially emarginate, its outer surface with low soft papillae, its inner surface with regular transverse series of small papillae with a horny covering, giving the lip a rasp-like appearance. Median part of lower lip thick, triangular and provided with similar papillae as the inside of the lower lip; laterally it forms together with the upperlip, with which

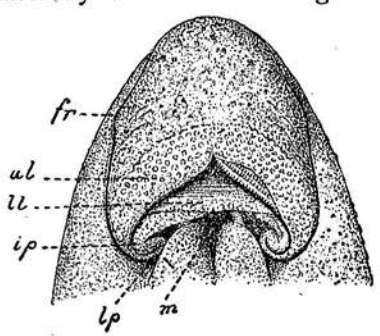


Fig. 90. *Gyrinocheilus pustulosus* Vaill. × 3. *fr* lateral furrow including the parts of the mouth; *ip* involuted part of upper and lower lip; *ll* lower lip; *lp* lateral, *m* median part of postlabial groove; *ul* upper lip, on one side partly reflected, to show the horny rasp.

it is connected, an involuted prolongation, situated in the lateral part of the postlabial groove; this groove is divided in a median and two lateral parts by two fleshy prolongations, broadly originating from the isthmus and tapering towards the lower lip. No barbels. Eye with a free orbital margin. Simple rays of dorsal totally or partly ossified, with 9 branched rays and originating far in advance of the ventrals. Anal short, with 5 branched rays. Caudal emarginate. Ventrals and pectorals horizontal. Scales rather small. Lateral line straight, running in the middle of the tail. Branchial openings rather narrow, their superior part not covered by the opercular flap, but forming a vertical oval opening, closed at the inside by a moveable velum. Gillmembranes broadly united with the isthmus. No pharyngeal teeth.

Distribution: One species from Borneo and one from Siam, in mountain streams.

1. **Gyrinocheilus pustulosus** Vaillant.

Gyrinocheilus pustulosus Vaillant, Notes Leyden Mus. XXIV. 1902, p. 111.
Gyrinocheilus pustulosus Popta, Notes Leyden Mus. XXVII. 1906, p. 180.

D. 3.9; A. 3.5; P. 1.14; V. 1.8; L. l. 40—41; L. tr. $\frac{8}{\text{about } 12}$.

Height 4—5.2, 5—6.4 in length with caudal. Head 3.6—3.8, 4.6—4.7 in length with caudal. Eye 6.7—10, 3.7—6 in snout, 2.5—3.8 in interorbital space. Origin of dorsal opposite to 11th scale of lateral line. Dorsal nearly truncate, shorter than head. Origin of anal opposite to 31st scale of lateral line. Height of anal equal to that of dorsal. Origin of ventrals separated by 4 scales from 18th scale of lateral line, opposite to 5th branched ray of dorsal. Ventrals shorter than pectorals, which are somewhat shorter than head. Caudal emarginate, the lobes rounded, about equal to length of head. Least height of caudal peduncle $6^2/_3$ in length of head, about equal to length of caudal peduncle, surrounded by 16 scales. In immature specimens irregular series of black blotches on the back and on the flanks, in adult specimens a broad darkish longitudinal band along the sides. Length 355 mm.

Nom. indig.: Tĕlurè (Bŏ).

Habitat: Borneo (river Kapuas: mouth of river Raun and Upper Sibau, river Bŏ! affluent of river Mahakam).

25. Paracrossochilus Popta.

(POPTA, Notes Leyden Mus. XXIV. 1902—04, p. 200).

Elongate. Head conical. Dorsal outline somewhat convex. Head and body ventrally flattened. Mouth inferior. Snout prominent, rounded, anteriorly on each side with (males?) or without a strong horny tubercle. Upper lip forms a broad fold, covered by numerous round soft papillae, arranged in longitudinal series towards its border, which is superficially crenulated and overhangs a wide vestibulum of the mouth. The lower lip forms a median prominent broad body, emarginated anteriorly, rounded laterally, not separated from the isthmus and covered with the same papillae as the upper lip. It has on each side a lateral part, forming a soft, curved prolongation connected with the upper lip, situated in a deep groove repre-

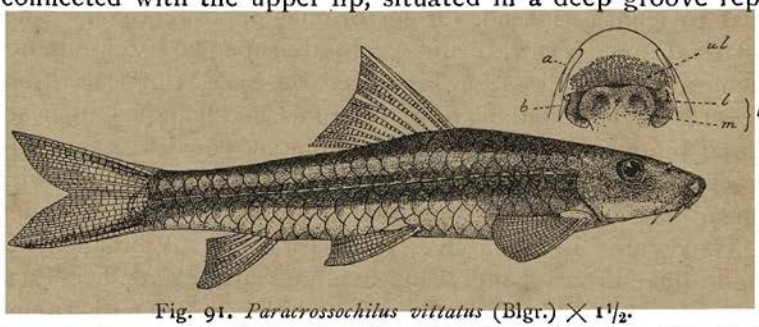


Fig. 91. *Paracrossochilus vittatus* (Blgr.) × 1½.
Separate figure: view of ventral surface of head. *a* rostral, *b* maxillary barbel; *l* lateral, *m* median part of lower lip (*ll*); *ul* upper lip.

senting the lateral part of a postlabial groove, where it is folded. The upper lip carries a barbel, where it is connected with the forward prolongation of the lower lip. A pair of rostral barbels at the inner side of a lateral furrow, which is a forward continuation of the postlabial groove. Jaws with sharp edges, bordering the transverse gape of mouth, the lower one with a symphysial tubercle. Eye with a free orbital margin. Dorsal with 8 branched rays, simple rays not ossified, originating far in advance of origin of ventrals. Anal short, with 5 branched rays. Caudal bifurcate. Ventrals and pectorals horizontal. Scales large. Lateral line straight, running in the middle of the tail. Pharyngeal teeth 6.3—3.6. Branchial openings narrow. Gillmembranes broadly united to the isthmus.

Distribution: The single known species from Borneo, in mountain streams.

1. Paracrossochilus vittatus (Blgr.).

Crossochilus vittatus Boulenger, Ann. Mag. Nat. Hist. (6) XIII. 1894, p. 247. *Paracrossochilus bicornis* Popta, Notes Leyden Mus. XXIV. 1902—04, p. 201. — Ibid. XXVII, 1906, p. 122.

D. 2.8; A. 2.5; P. 1.14—15; V. 1.7—8; L. l. 28—29; L. tr. $\frac{3\frac{1}{2}}{3\frac{1}{2}-4}$.

Height about 5 to 5.2, about 6 to 6.5 in length with caudal. Head 4.5 to about 5, 5.6 to 6 in length with caudal. Eye 4—$4^1/_2$, 1.7 to almost 2 in interorbital space and twice in snout. In some specimens (males?) on each side of the snout, near its extremity, a conical pointed horny tubercle. Rostral barbels somewhat smaller than eye, maxillary barbels still shorter. Origin of dorsal opposite to 10th scale of lateral line, separated by 10 scales from occiput. Dorsal slightly emarginate, its height equal to length of head. Origin of anal opposite to 21st scale of lateral line. Ventrals and pectorals subequal. Ventrals not reaching anal, their origin separated by 2 series of scales from the 11th scale of lateral line. Pectorals nearly equal to head. Caudal bifurcate, its lobes slightly pointed, equal to or slightly longer than head. Least height of caudal peduncle about twice in head and more than $1^1/_2$ times in its own length, surrounded by 8—9 scales. Brown above, yellowish below. A broad lateral longitudinal brown band. Fins hyaline, with a dark hue. Each lobe of caudal with an intramarginal dark band. Length 74 mm. [Type of *Cr. vittatus* Blgr. and *P. bicornis* Popta in the British and Leiden Museum seen by us].

Nom indig.: Seluwang howong, Tulüm (Howong).

Habitat: Borneo (river Howong, one of the tributaries of river Mahakam!, Upper Kapuas, Sarawak in rivers Senah, Poeh and Tagora).

26. Discognathus Heckel.

(Heckel, Russegger's Reise I. 2. Theil, 1843, p. 1027).

Oblong, dorsal surface slightly convex. Ventral surface of head and body flattened. Snout prominent, obtusely rounded, more or less depressed, with horny tubercles and a superficial or deep horizontal furrow. Upper lip broad, covered by soft round papillae, its free border crenulated, carrying a barbel, where it passes over in the lower lip; it overhangs a vestibulum of the mouth. Lower lip modified into a suctorial disk, with a narrow anterior and a broad rounded posterior margin, both

margins are free and covered with soft round papillae. These are missing in the centre of the lip, which forms an oval fleshy cushion. Postlabial groove continued forward and laterally to near rostral barbel, which may be absent. Jaws covered with a horny sharp edge, bordering the slightly crescent-shaped transverse opening of mouth. Dorsal with 7 or 9 branched rays, the simple rays may be partly ossified. Dorsal originating somewhat in advance of origin of ventrals. Anal short, with 5 branched rays.

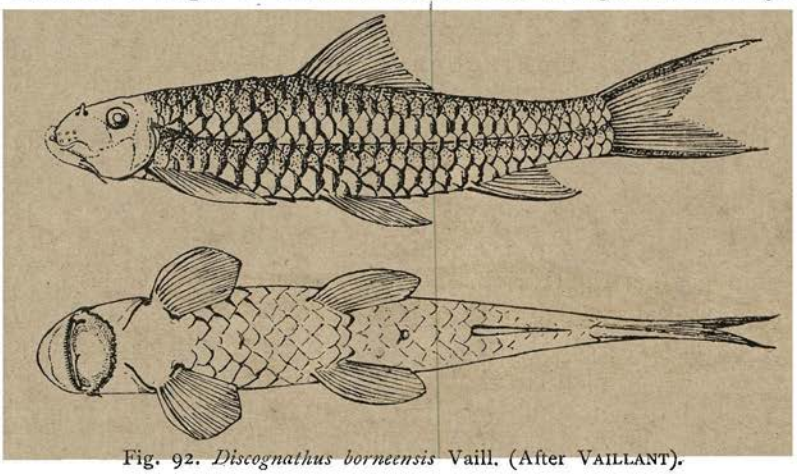


Fig. 92. *Discognathus borneensis* Vaill. (After VAILLANT).

Caudal emarginate. Pectorals and ventrals horizontal. Scales large or of moderate size. Lateral line straight, running in the middle of the tail. Branchial openings rather narrow. Gillmembranes broadly united to isthmus. Pharyngeal teeth 5.4.2—2.4.5.

Distribution: Rivers, especially mountain rivers, of North-East Africa, Southern Asia, Ceylon and Borneo.

1. Discognathus borneensis Vaill.

Discognathus borneensis Vaillant, Notes Leyden Mus. XXIV. 1902, p. 91.
Garra borneensis Fowler, Proc. Acad. Nat. Sc. Philadelphia (2) LVII. 1905, p. 482.

D. 2.8; A. 2.5; V. 1.8; L. l. 28; L. tr. $\frac{4}{5}$.

Height more than 5, 6.4 in length with caudal. Head 4.2, 5.3 in length with caudal. Eye more than 5, more than thrice in snout and about twice in interorbital space. Snout obtuse, prominent, with a horizontal furrow and with numerous horny small papillae, 3 or 4 of which are more conspicuous. Four barbels. Origin of dorsal before middle of length. Height of

dorsal equal to height of body. Ventrals surpassing anus, their origin opposite to the first third of the dorsal. A broad deep slaty-dusky band enclosing lateral line from eye to base of caudal. A brownish streak on upper and lower caudal rays. Fins more or less dusky. Length about 100 mm. [After VAILLANT and his type specimen in the Leiden Museum, seen by us].

Nom. indig.: Ukau (Bluu).

, Habitat: Borneo (river Bluu!, tributary of river Mahakam, Baram river).

27. **Epalzeorhynchus** Bleeker.

(BLEEKER, Nat. Tijdschr. Ned. Indië IX. 1855, p. 270).

Elongate, cylindrical. Dorsal and ventral profile slightly

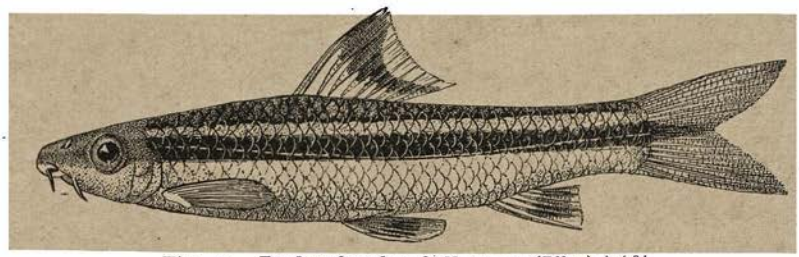


Fig. 93. *Epalzeorhynchus kallopterus* (Blkr.) $\times$ $^{9}/_{10}$.

convex. Snout obtusely rounded, prominent, with a free moveable

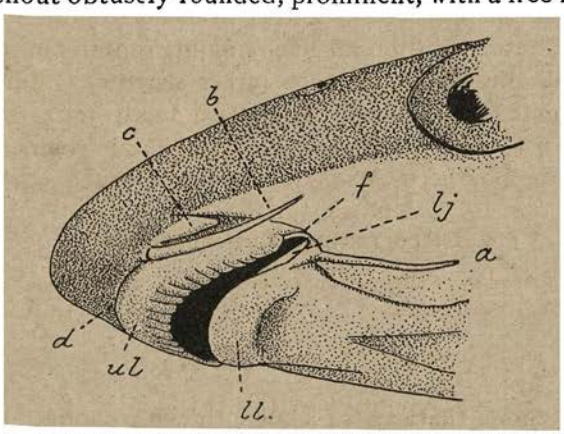


Fig. 94. Anterior part of head of *Epalzeorhynchus kallopterus* (Blkr.) partly seen from below. *a* maxillary, *b* rostral barbel; *c* moveable lateral lobe; *d* demarcation between snout and upper lip; *f* frenulum between lips; *lj* lower jaw; *ll* lower lip; *ul* fringed upper lip.

lateral lobe, the base of which is formed by bone. No pen-

dulous rostral fold. Upper lip fringed, covering the square inferior gape of mouth when closed. Lateral part of lower lip connected by a frenulum with the lateral part of the upper lip. Upper jaw with a sharp edge, its broadened lateral parts introverted and embracing the lateral parts of the lower jaw, which has a sharp bony edge. Postlabial groove only represented by a shallow longitudinal groove near corner of mouth. Two pairs of barbels. A rostral one below the moveable lobe, the hinder one behind the corner of the mouth. Eye with a rather broad free orbital margin. Short dorsal without osseous ray, with 8 branched rays, situated in the anterior half of the total length, opposite to ventrals. Anal short, with 5 branched rays. Pectorals short, rounded. Caudal incised. Scales rather large. Lateral line straight, running in the middle of the tail. Pharyngeal teeth 5.4.2—2.4.5. Branchial openings rather narrow, subvertical. Gillmembranes broadly united with isthmus.

Distribution: The single known species in fresh water in Sumatra and Borneo.

1. **Epalzeorhynchus kallopterus** (Blkr.).

Barbus kalopterus Bleeker, Nat. Tijdschr. Ned. Indië I. 1850, p. 13.
Epalzeorhynchus kalopterus Bleeker, Nat. Tijdschr. Ned. Indië IX. 1855, p. 270.
Epalzeorhynchus kallopterus Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 118. — Atl. Ichth. III. 1863, p. 38.
Epalzeorhynchus callopterus Günther, Cat. Brit. Mus. VII. 1868, p. 76.
Epalzeorhynchus kallopterus Vaillant, Nouv. Arch. Mus. Hist. Nat. (3) V. 1893, p. 77.

D. 3.8; A. 2.5; P. 1.15; V. 1.8; L. l. 34—36; L. tr. $\frac{5\frac{1}{2}}{1\ \ \ }$ (below origin of D.).

Height about 4.6, more than $5^1/_2$ in length with caudal. Head 4.2—4.8, 5.3 to almost 6 in length with caudal. Eye 4, about twice in snout and in interorbital space. Barbels equal, somewhat shorter than eye. Origin of dorsal opposite to 10th scale of lateral line, much nearer to end of snout than to root of caudal, separated by 10—11 scales from occiput. Dorsal concave, its height slightly more than length of head; with its median part opposite to origin of ventrals. Origin of anal opposite to 23rd scale of lateral line. Anal concave, its height about $^4/_5$ of length of head. Ventrals rounded, nearly equal to pectorals, scarcely reaching anus, which is remote from anal; their origin separated by 4 or $4^1/_2$ scales from 13th scale of

lateral line. Pectorals rounded, somewhat shorter than head. Caudal incised, the lobes pointed, about equal to head. A broad brown band runs from the snout to the end of the middle caudal rays, including the lateral line, separated from the dark back by a light streak of the same colour as the ventral surface. Dorsal and anal with a broad oblique black band, ventrals with a large black patch. Length 160 mm.

Nom indig.: Selimang and Selessur (Djambi).

Habitat: Sumatra (Palembang, Lahat, river Batang Hari: Djambi!, river Kwantan: Taluk!); Borneo (river Kapuas: Pontianak, Sintang, Sebruang, Sibau, river Kahajan, Banjermassin).

28. Crossochilus (v. Hasselt) Bleeker.

(Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 525).

Elongate, compressed. Dorsal and ventral profile slightly convex. Snout obtusely rounded, prominent, without a lateral lobe, with larger or smaller pores and horny tubercles. No pendulous rostral fold. Upper lips generally fringed, covering the square inferior gape of mouth when closed, and sending from its lateral part a cutaneous frenulum to the lateral part of the lower jaw, but not continued to the lower lip.

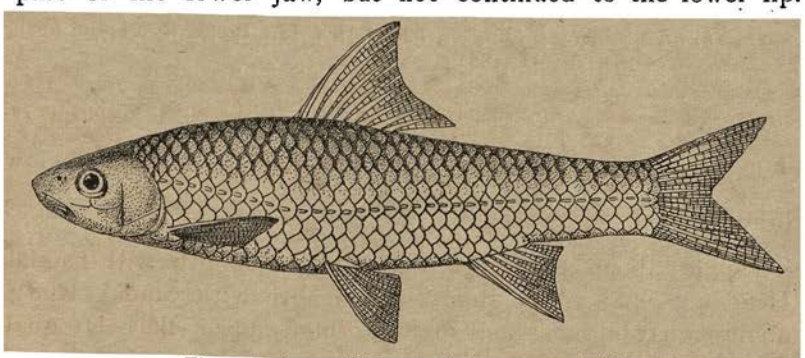


Fig. 95. *Crossochilus gnathopogon* n. sp. $\times$ 5/6.

Lower lip rather fleshy, without postlabial groove, not connected with the upper lip. Upper jaw with a sharp edge, its broadened lateral parts introverted and embracing the lateral part of the lower jaw, which has a sharp bony edge and a symphysial ridge. A pair of rostral and of maxillary barbels, one pair or the other may be absent. Eye with a free orbital margin. Short dorsal without osseous ray and with 8 branched

rays, situated in the anterior half of the total length and originating before ventrals. Anal short, with 5 branched rays. Pectorals short, rounded, subhorizontal. Caudal forked. Scales rather large. Lateral line straight, running in the middle of

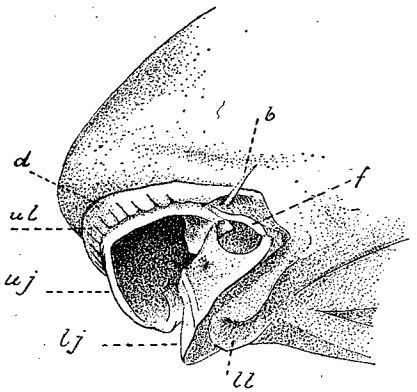


Fig. 96. Opened mouth of *Crossochilus gnathopogon* n. sp. × 4. *b* maxillary barbel; *d* line of demarcation between skin of rostrum and upper lip; *f* frenulum; *lj* lower jaw; *ll* lower lip; *uj* upper jaw; *ul* fringed upper lip.

the tail. Pharyngeal teeth 5.4.2—2.4.5, obliquely truncate. Branchial openings rather narrow, gillmembranes broadly united to isthmus.

Distribution: Fresh water of Indo-australian Archipelago (Sumatra, Java, Borneo) and East-Indian Continent.

Key to the indo-australian species.

I. Two barbels only.
  a. Only a pair of rostral barbels . . . . . *C. oblongus* p. 232.
  b. Only a pair of maxillary barbels . . . . . *C. gnathopogon* p. 233.

II. Four barbels.
  1. $5^1/_2$ scales below lateral line, 3 scales between origin of ventrals and lateral line . . . . . *C. cobitis* p. 234.
  2. $4^1/_2$ scales below lateral line, 2 scales between origin of ventrals and lateral line . . . . . *C. langei* p. 234.

1. Crossochilus oblongus (C.V.)

Labeo oblongus Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 357.
Crossocheilos oblongus Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 525.
Crossocheilos (Crossocheilos) oblongus Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 124. — Atl. Ichth. III. 1863, p. 40.
Crossochilus oblongus Günther, Cat. Brit. Mus. VII. 1868, p. 73.
Crossochilus oblongus var. *nigriloba* Popta, Notes Leyden Mus. XXVII. 1906, p. 120.

D. 3.8; A. 3.5; P. 1.14—15; V. 1.8; L. l. 33—34; L. tr. $\frac{4\frac{1}{2}}{1}$.
$\quad\quad\quad

nearly reaching anus, their origin opposite to 12th or 13th scale of lateral line and to 3rd branched ray of dorsal, separated by $3^1/_2$ scales from lateral line. Pectorals equal to head. Least height of caudal peduncle about $1^1/_2$ in length of head and in length of caudal peduncle, surrounded by 12 scales. Caudal forked, much longer than head. Silvery, back brownish, a faint silvery band above lateral line. Length 128 mm. [Type of the species in the zoological Museum of Amsterdam].

Habitat: Sumatra (Fort de Kock!).

3. Crossochilus cobitis (Blkr.).

Lobocheilos cobitis Bleeker, Nat. Tijdschr. Ned. Indië V, 1853, p. 523.
Crossocheilos (Crossocheilichthys) cobitis Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 125. — Atl. Ichth. III. 1863, p. 40.
Crossochilus cobitis Günther, Cat. Brit. Mus. VII. 1868, p. 73.
Crossochilus cobitis Popta, Notes Leyden Mus. XXVII. 1906, p. 120.

D. 3.8; A. 3.5; P. 1.14; V. 1.8; L. l. 32—34; L. tr. $\frac{4\frac{1}{2}}{1}$.
$\frac{}{5\frac{1}{2}}$

Height nearly equal to length of head. Head $4^1/_4$, $5^1/_2$—$5^3/_4$ in length with caudal. Eye 3 or somewhat more, $^3/_4$ of the length of the snout and $1^1/_4$—$1^1/_3$ in the interorbital space. A pair of rostral and maxillary barbels, the rostral ones the longer, but much smaller than the eye. Dorsal emarginate, about as high as the body, separated by 8—9 scales from occiput. Anal emarginate, much lower than dorsal. Ventrals slightly shorter than pectorals, not reaching anal, their origin separated by 3 scales from lateral line. Pectorals $5^3/_4$—6 in length, not reaching ventrals. Caudal deeply incised, 4 in length, much longer than head. Margaritaceous, dark above. A silvery band runs along the side, in the middle of which sometimes runs a dark streak. A round blackish spot on the end of the lateral line. Length 148 mm.

Nom. indig.: Lukas (Malay. Batavia); Pedang Larān (Bulit).

Habitat: Sumatra (Padang); Java (Batavia, Surabaya); Borneo (river Kapuas: river Bongan, Bulit, river Bŏ affluent of river Mahakam).

4. Crossochilus langei Blkr.

Crossocheilos (Crossocheilichthys) Langei Bleeker, Ichth. Arch. Ind. Prodr. II. Cyprini, 1860, p. 127. — Atl. Ichth. III. 1863, p. 41.
Crossochilus langii Günther, Cat. Brit. Mus. VII. 1868, p. 74.

D. 3.8; A. 3.5; P. 1.14; V. 1.8; L. l. 34; L. tr. $\frac{4\frac{1}{2}}{1}$.
$\frac{}{4\frac{1}{2}}$

Height 4.8, 6.1 in length with caudal. Head about 4.2, 5.3 in length with caudal. Eye about 3.1, $^3/_4$ length of snout and about 1.1 in interorbital space. Four barbels, the rostral ones longer than the maxillary ones, but shorter than the eye. Dorsal emarginate, slightly higher than the body, separated by 9 scales from occiput, its origin opposite to 11th scale of lateral line. Anal emarginate, much lower than dorsal. Pectorals and ventrals subequal; ventrals not reaching anal, their origin separated by 2 series of scales from lateral line. Pectorals about $6^3/_4$ in total length, slightly shorter than head. Caudal deeply incised, $4^1/_5$ in length. Least height of caudal peduncle somewhat more than twice in head and nearly 1.7 in its own length; surrounded by 16 scales. A brownish band runs along the lateral line and terminates in a black spot on the middle of the base of the caudal fin. A blackish spot between vent and anal. Length of single specimen known 77 mm. [Type of species in the British Museum seen by us].

Habitat: Sumatra (Palembang).

Species of Cyprinoidea doubtful as to their systematic position and habitat.

Pachystomus gobioformis Kner.

Pachystomus (?) *gobioformis* Kner, Sitzber. Akad. Wien Bd. LIII. 1866, p. 548. — Novara-Exp. Fische I. 1865—1867, p. 353.
Barbus gobioformis Günther, Cat. Brit. Mus. VII. 1868, p. 129.

D. 10; A. 8; P. 13; V. 8; L. l. 36—38; L. tr. $\frac{6}{1}$ (between D. and V.).
$\frac{}{4}$

Height nearly equal to length of head, which goes $4^1/_3$—$4^1/_2$ in total length. Eye $4^1/_3$—$4^1/_2$, more than one eyediameter from end of snout and $1^1/_2$ in interorbital space. Snout arched, the somewhat oblique mouthopening not reaching to below nostrils. Lower jaw shorter than the upper one, both with trenchant, thin border. Anterior barbels reaching eye, the posterior ones nearly to praeoperculum. Lower lip forming a simple reversed fold. Symphysis with a tubercular prominence. Skin behind jaws folded and papillar as if provided with fine teeth.

Branchial openings reaching to below eye. A small pseudobranchia. Humerus forms above pectorals a triangle, with the point directed backwards. Praeoperculum situated slightly before occiput. Origin of dorsal behind half length of body and somewhat behind origin of ventrals. Height of dorsal anteriorly equal to that of body, strongly descending backwards and rounded. Anal in height and form equal to dorsal. Ventrals reaching anus, pectorals shorter, not reaching ventrals. Caudal semilunary incised. Scales weak, showing radii only in their sessile part, on their free part strong concentric lines, in the middle a retiform structure, they are smallest on back and anterior part of belly. Pointed scale above ventrals absent. Lateral line nearly straight, with simple tubes. Back and sides brown. Abdomen silvery white, along the lateral line anteriorly a diffuse dark band, dissolving on the tail in three to four subsequent large black blotches. Dark brown clouds on back and base of dorsal and caudal. Lower half of dorsal with an oblique brown band, a longitudinal one in the middle of the caudal. Length about 90 mm. [After KNER, not seen by us].

This species was placed by KNER with a query in the genus *Pachystomus*. GÜNTHER mentions it as a *Barbus* and says: „said to be from Java, but evidently allied to the east-asiatic types of *Barbus*." KNER himself gives as habitat: „von Java?" It is therefore very doubtful if this is really a javanese species, as the localities given by KNER are often erroneous.

Ellopostoma Vaillant.

(VAILLANT, Notes Leyden Mus. XXIV. 1902, p. 145, note).

Elongate, anteriorly and posteriorly compressed, head depressed and flattened above. Snout bluntly rounded, very prominent. Mouth inferior, very small and extremely protractile, provided with a pair of barbels at its corner. Dorsal long, with 16 branched rays, its origin before that of ventrals. Anal short, far behind end of dorsal. Ventrals and pectorals horizontal; only one of the outer pectoral rays simple. Caudal deeply emarginate. Scales small, multiradiate; lateral line present. Branchial openings ending below base of pectorals. Gillmembrane broadly united to isthmus. Pharyngeal teeth unknown.

Distribution: The single known species from fresh water in Borneo.

Ellopostoma megalomycter (Vaillant).

Aperioptus megalomycter Vaillant, Notes Leyden Mus. XXIV. 1902, p. 145.

D. 3.16; A. 3.5; P. 1.11; V. 1.7; L. l. 65; L. tr. $\frac{9}{1}$.
$\frac{}{14}$(?)

Height 5, equal to head, 6.3 in length with caudal. Eye 3.2, slightly longer than snout and equal to interorbital space. Dorsal nearly half higher than length of head; its origin before that of ventrals, separated by about 20 scales from occiput.

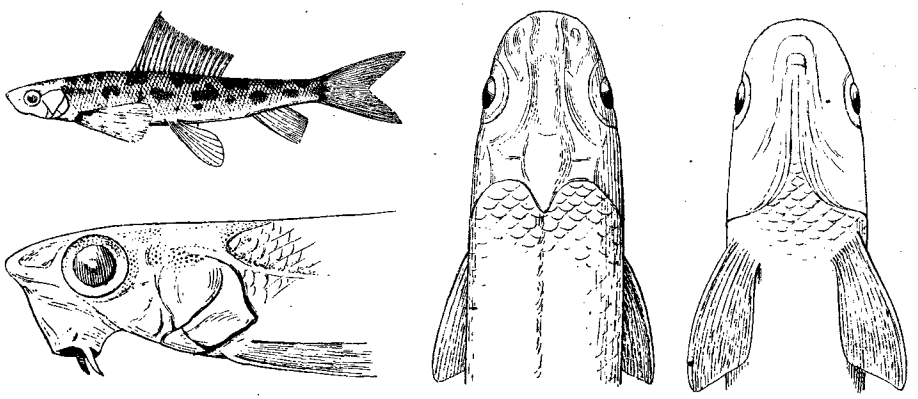


Fig. 97. *Ellopostoma megalomycter* (Vaill.). (After VAILLANT).

Height of anal slightly less than length of head. Ventrals equal to head, separated by 8 scales from lateral line, surpassing anus. Pectorals somewhat longer than head, not reaching ventrals. Caudal much longer than head. Least height of caudal peduncle somewhat less than its own length and more than twice in head, surrounded by 24 scales. Silvery, with about 2 irregular series of dark patches of different size and form on the upper half of the body. Length 51 mm. [Type of the species in the Leiden Museum seen by us].

Habitat: Borneo (river Kapuas!).

Note: VAILLANT places this species in the enigmatic genus *Aperioptus* Rich. (see p. 238). We think there is no reason to do so. We therefore use for it the name *Ellopostoma*, which VAILLANT proposed in case his fish should appear not to be an *Aperioptus*.

In the second place VAILLANT brings *Aperioptus* and therefore also *Ellopostoma* in the family *Cobitidae*. We doubt the correctness of this view, although we are not able to say, to which family of *Cyprinidae* these probably young fish belong.

Cirrhina breviceps C.V.

Cirrhina breviceps Cuvier & Valenciennes, Hist. Nat. Poissons XVI. 1842, p. 293.

VALENCIENNES mentions this species from "la rivière de Bantam."

Already BLEEKER (Ichth. Arch. Ind. Prodr. II. Cyprini 1860, p. 140 and Atl. Ichth. III. 1863, p. 54) has doubted the correctness of the definition of VALENCIENNES. The description was made after a dried specimen, which VALENCIENNES saw in the Leiden Museum but which does not exist there any more. Probably it was a species of *Labeo.*

Opsariichthys temmincki (Schleg.).

Leuciscus temminckii Schlegel, Fauna japonica Poiss. 1847, p. 210.
Opsariichthys temminckii Günther, Cat. Brit. Mus. VII. 1868, p. 205.

J. KAROLI (Termeszetrajzi Füzetek V. 1882, p. 43) mentions in his list of collected fishes *Opsariichthys temmincki* (Schleg.). from Borneo, Sarawak. We suppose that this habitat is erroneous as the quoted species is only known from Japan.

APPENDIX.

Aperioptus pictorius Richardson.

Aperioptus pictorius Richardson, Voy. Samarang, Fishes 1848, p. 27.

RICHARDSON says about this species:

„Radii. — D. 13; A. 11; C. $18\frac{13}{13}$; P. 11; V. 9.

„Of this fish I can give no details. There were two speci-
„mens which I unfortunately placed in the hands of the artist

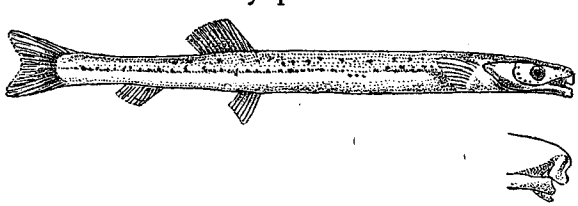


Fig. 98. *Aperioptus pictorius* Rich. nat. size. (After RICHARDSON).

„before I had examined them, except very cursorily. While
„he was employed in sketching, he put them into a plateful
„of water for the purpose of expanding their fins more per-

„fectly, and forgetting that he had not returned them into the „spirits, they were thrown out and lost. The general aspect „of the fish is that of a slender *Galaxias*, but there are no „teeth on the jaws. The orifice of the mouth is a narrow „vertical oval, which is restricted on the sides by membranous „processes. The figure is of the natural size.

„Habitat: Borneo."

We reproduce his figure.

GÜNTHER (Cat. Brit. Mus. VII. 1868, p. 371) says about this species: "Unfortunately the specimens were lost, so that no description could be given of them. The fish has the form of a *Lepidocephalus*, the dorsal being placed far backwards, nearly opposite to the ventrals. But the mouth is represented as transverse, curiously lobed, and without barbels."

Its position is doubtful. Certainly it has nothing to do with *Aperioptus megalomycter* Vaillant described by us as *Ellopostoma megalomycter* (Vaillant) on pag. 237.

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Order APODES Linné.

Physostome. Body anguilliform or bandshaped. Scales absent, vestigial or small. Lateral line present or absent. Skull long, the supraoccipital separated from the frontals by the parietals, which are meeting. Upper jaw formed by the dentigerous maxillaries, the intermaxillaries not developed as distinct bones but represented by a dentigerous bony plate (intermaxillary plate), ankylosed with the mesethmoid and generally also with the vomer. This plate completes the upper jaw anteriorly. Palato-pterygoids small or reduced, without teeth. Opercular bones small; the membrane covering the large branchial chambers chiefly supported by the long branchiostegals. Anterior vertebrae not modified, no Weberian ossicles. Pectoral arch not attached to the skull; pectorals present or absent; ventrals absent. Caudal if present united with dorsal and anal, the rays of which are never spinous. A single pair of dentigerous upper pharyngeals opposed to the separate lower pharyngeals. The branchial openings in the pharynx are wide or narrow slits. When young ribbon-shaped, translucent, pelagic or bathypelagic, passing through a series of stages known as *Leptocephali*, which are treated at the end of the *Apodes*.

Artificial key to the indo-australian families of Apodes.

I. Gillopenings ventral, united into an oval groove (see fig. 163, p. 335). Body and postorbital parts of head scaly. Branchial openings in pharynx wide slits . . . . . *Synaphobranchidae* p. 334.

II. Gillopenings separate, mostly lateral.

A. Distance of anus from gillopenings much more than length of head. Jaws not exceedingly slender and not much produced.

1. Body scaly. Anterior nostrils on top of snout, posterior in front of eye. Tongue free. Pectorals present. Dorsal, anal and caudal well developed. Origin of dorsal far behind gillopenings. Branchial openings in pharynx wide slits . . . . . *Anguillidae* p. 242.
2. Body scaleless. End of tail not free but with the caudal confluent with dorsal and anal, which both may be rudimentary.
   a. Nostrils lateral or superior.
      1. Pectorals present. Dorsal, anal and caudal well developed. Anus in anterior half of length. Tongue free or not. Teeth in narrow bands or at least partly in 2 or more series. Branchial openings in pharynx wide slits. *Congridae* p. 251.
      2. Pectorals present. Dorsal, anal and caudal well developed. Anus in anterior half of length. Tongue not free. Teeth acute, uniserial. Branchial openings in pharynx narrow slits . . . *Neenchelidae* p. 268.
      3. Pectorals absent. Dorsal, anal and caudal well developed. Tail ending in a slender tip or filament. Anus in anterior half of length. Tongue not free. Teeth cardiform bands. Branchial openings in pharynx wide slits. Bathypelagic . . . . . *Nettastomidae* p. 269.
      4. Pectorals absent. Dorsal, anal and caudal well developed. Anus in anterior half of length. Tongue free. Acicular teeth in bands. *Heterocongridae* p. 271.
      5. Pectorals absent. Dorsal, anal and caudal more or less developed, covered by thick skin; if dorsal and anal are rudimentary or absent, the teeth are bi- or triserial. Anus before or behind middle of length. Tongue not free. Teeth in one or more series. Branchial openings in pharynx narrow slits. . . . . *Muraenidae* p. 343.
      6. Pectorals small, vestigial or absent. Dorsal and anal confined to the tail; they may be reduced to a low fold. Anus far behind middle of length. Tongue not free. Teeth uniserial. First branchial opening in pharynx wide, following narrow slits . . . . . *Moringuidae* p. 336.
   b. Posterior nostrils generally near eye in the upper lip in a valve or protruding flap; anterior nostrils in a short tube at the margin of the upper lip.

Pectorals present or absent. Anus in anterior half of length. Tongue not free. Teeth in one or more series or in bands. Branchial openings in pharynx wide slits . . . . . *Myridae* p. 272.

3. Body scaleless. Dorsal and anal if present, not reaching end of tail, which is free, the caudal being absent. Anterior nostrils on the border of the upper lip or on ventral surface of snout. Pectorals present or absent. Anus before or behind middle of length. Tongue not free. Teeth in one or more series or in bands. Branchial openings in pharynx wide slits. *Ophichthyidae* p. 280.

B. Anus near gillopenings or its distance from them less than length of head. Jaws exceedingly slender and much produced, covered as also the vomer with close set, recurved teeth. Pectorals present. Bathypelagic. Branchial openings in pharynx wide slits . . . . . *Nemichthyidae* p. 326.

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1. Fam. ANGUILLIDAE.

Scales small, more or less linear, embedded in the skin in small groups, which are placed obliquely at right angles to those of the neighbouring groups. Very elongate, anteriorly subcylindrical, posteriorly compressed. Anus in the anterior half of the length; the origin of the dorsal above, somewhat behind or before it, but always inserted at some distance from the head. Dorsal, caudal and anal confluent. Pectorals well developed, with the rays unbranched. Head moderate, conical. Eyes covered by skin, without free orbital margin. Posterior nostrils in front of eye, anterior nostrils tubular and near anterior margin of snout. Cleft of mouth slightly oblique, extending below or behind the eyes. Lips laterally thick. Tongue anteriorly and laterally free. Ethmoid with intermaxillary plate not projecting at end of snout beyond the end of maxillaries. Teeth conical, small, in cardiform bands on jaws and vomer. Lateral line distinct. Gillopenings vertical slits in front and below base of pectorals and separated by a broad interspace. Branchial openings in pharynx are wide slits.

1. **Anguilla** Shaw.

(SHAW, Gen. Zool. IV. 1803, p. 15).

For characters of the single genus see those of the family.

Catadromeus fishes, passing their egg- and larval stage (*Leptocephalus*) in sea (see at the end of the *Apodes*), entering

as small, still unpigmented eels (montée) the mouth of rivers, changing here in small pigmented eels and ascending the rivers.

Fig. 99. *Anguilla celebesensis* Kaup.

Distribution: Widely distributed over the world, but not extending into the arctic and antarctic regions and wanting on the west-coast of Africa, on the Pacific coast of America and on the Atlantic coast of South-America.

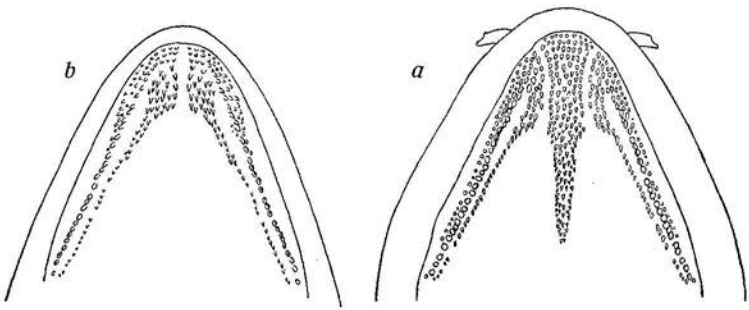

Fig. 100. Dentition of *Anguilla mauritiana* Benn.
a upper jaw with vomerine and maxillary teeth, *b* lower jaw; the mandibulary and maxillary teeth with a longitudinal edentulous groove. nat. size.

Key to the indo-australian species of Anguilla.

I. Distance between origin of dorsal and anal more than half length of head.

A. Maxillary and mandibulary band of teeth longitudinally divided by an edentulous groove.

1. Origin of dorsal nearer to anus than to gill-opening . . . . . *A. elphinstonei* p. 244.
2. Origin of dorsal nearer to gillopening than to anus . . . . . *A. mauritiana* p. 245.

B. Maxillary and mandibulary band of teeth without an edentulous groove.

1. Mouthopening reaches in the young the hindborder of eye, when fullgrown to about 1 eye-diameter behind eye . . . . . *A. celebesensis* p. 247.
2. Mouthopening reaches even in the adult the hindborder of the pupil only. . . . . *A. malgumora* p. 248.

II. Origin of dorsal above or a little before anus. Bands of teeth without an edentulous groove.

A. Mouthopening reaches hindborder of pupil or not so far; eye 6—7 times in length of head . . . . *A. spengeli* p. 249.

B. Mouthopening reaches to hindborder of eye or farther; eye 8—12 times in length of head . . . *A. australis* p. 249.

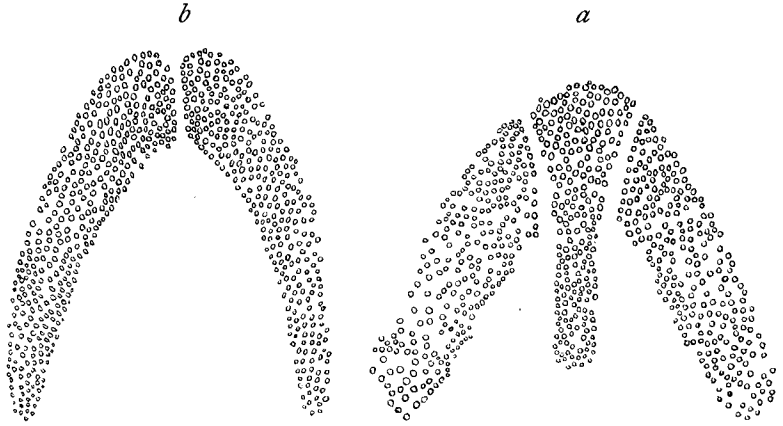

Fig. 101. Dentition of *Anguilla celebesensis* Kaup.
a vomerine and maxillary teeth, *b* mandibulary teeth. × 2.5.

1. Anguilla elphinstonei Sykes.

? *Muraena maculata* Hamilton Buchanan, in: Fishes Ganges, 1822, p. 23 (nec Lacepède).

? *Muraena bengalensis* Gray, Hardwick Illustr. Ind. Zoology, 1830—1832, Pl. 95, fig. 5.

Anguilla elphinstonei Sykes, Trans. Zool. Soc. London, vol. II. 1841, p. 377.

Anguilla brevirostris McClelland, Calcutta Journ. Nat. Hist. vol. V. 1845, p. 177.

Anguilla aracana McClelland, Ibid. p. 178.

Anguilla nebulosa McClelland, Ibid. p. 178.

Anguilla variegata McClelland, Ibid. p. 179.

Anguilla nebulosa Bleeker, Nalez. Ichth. Fauna v. Bengalen, Verh. Batav. Genootsch. XXV. 1853, p. 153.

Muraena maculata Day, Fishes of Malabar, 1865, p. 244 (p.p.).

Anguilla bengalensis Günther, Cat. Brit. Mus. vol. VIII. 1870, p. 27.

Anguilla bengalensis Day, Fishes of India, 1878—1888, p. 659 (p.p.). — Fauna of British India, Fishes, vol. I. 1889, p. 86.

Anguilla elphinstonei Max Weber, Zoolog. Jahrb. Suppl. XV. Bd. 1, 1912, p. 578.

Anguilla bengalensis Boulenger, Cat. Fresh-water fishes Africa. III. 1915, p. 7 (p.p.).

According to length, height 17—20, head 7—$8^3/_5$. Eye 11—12, $1^3/_4$—2 in interorbital space and a little more than twice in snout, which goes 5 times in head. Gape of mouth $3^1/_5$—$3^2/_3$

times in head, reaching somewhat behind hindborder of eye. Length of head less than its distance from dorsal ($^1/_{10}$—$^1/_3$ of length of head), somewhat more or less than half its distance from anus, equal to or somewhat less than the distance between dorsal and anal. Pectorals a little more than thrice in head. Length of snout scarcely more than the breadth at its base. Tail $^1/_3$ of its length, longer than head and trunk. Vomerine teeth in an elongate quadratic patch with somewhat concave sides anteriorly, tapering rather abruptly posteriorly into a lancet-shaped peduncle, which ends before the maxillary band of teeth. This last tapers posteriorly and is formed by one row of larger teeth, with on its outer side a row of smaller teeth and on its inner side an edentulous groove, which is bordered by an incomplete row of smaller teeth. The same occurs in the lower jaw. Colour of alcohol specimens light below, otherwise dark green with more or less distinct darker marmorations. Vertical fins often with a light border. Is said to attain 1200 mm.

Habitat: Sumatra (Serdang!), Java! [1]), Celebes (Menado!) — Burma and British India.

2. **Anguilla mauritiana** Benn. [Fig. 100, 102, p. 243, 246].

Anguilla mauritiana Bennett, Proc. Comm. Zool. Soc. London, 1831, p. 128.
Anguilla labrosa Richardson, Zool. Voy. Erebus & Terror, vol. III. 1844, p. 113.
Anguilla labiata Peters, Monatsber. Akad. Berlin, 1852, p. 684.
Anguilla elphinstonei Bleeker, Nat. Tijdschr. Ned. Indië, vol. IV, 1853, p. 504 (nec Sykes).
Muraena maculata Bleeker, Atl. Ichth. vol. IV. 1864, p. 9 (nec Ham. Buchanan).
Anguilla johannae Günther, in: Playfair & Günther, Fishes of Zanzibar, 1866, p. 124.
Anguilla labiata Günther, Ibid. p. 124.
Muraena marmorata Kner, Novara-Reise, Fische 1865—1867, p. 369 (nec Q. & G., nec Kaup).
Anguilla labiata Peters, Reise nach Mossambique, Flussfische, 1868, p. 94.
Anguilla mauritiana Günther, Cat. Brit. Mus. vol. VIII. 1870, p. 25 (nec Synon.). — Fische d. Südsee, Vol. III. 1910, p. 390.
Anguilla fidjiensis Günther, Cat. Brit. Mus. vol. VIII. 1870, p. 26. — Fische d. Südsee, vol. III. 1910, p. 390.
Muraena mauritiana Bleeker, Ned. Tijdschr. Dierk. vol. IV. 1873, p. 123. — Arch. néerl. sc. nat. vol. XIII. 1878, p. 38, 56.
Anguilla labiata Pfeffer, Ostafrikanische Fische, gesamm. von Stuhlmann, Jahrb. Hamburg. Anst. vol. X. 1893, p. 41.

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1) Two stuffed specimens in the Leiden Museum, the measurements of which Miss C. POPTA was kind enough to take for us (see F. SARASIN and J. ROUX, Nova Caledonia. Zoologie II. Poissons par M. WEBER & DE BEAUFORT 1915, p. 23).

Anguilla labiata Pfeffer, in: Die Fische Ost-Afrikas, 1896, p. 71.
Anguilla mauritiana Jordan & Everman, Proc. U. S. Nat. Mus. vol. XXV, 1902, p. 325.
Anguilla mauritiana Steindachner, Sitzber. Akad. Wien, 1906, p. 1420.
Anguilla mauritiana Jordan & Seale, Bull. Bur. Fish. XXV. 1906, p. 192.
Anguilla mauritiana Max Weber, Zoolog. Jahrb. Suppl. XV. Bd. 1, 1912, p. 582.
Anguilla bengalensis Boulenger, Cat. Fresh-water fishes Africa. III. 1915, p. 7. (p.p.).

According to the length, the height is 14—21, the head $7—7^3/_4$; the eye 9—15, 2—3 times in the interorbital space and 2—3 times in the snout, the length of which goes about $4^1/_2$ times in the head. Mouthopening thrice in head and reaches

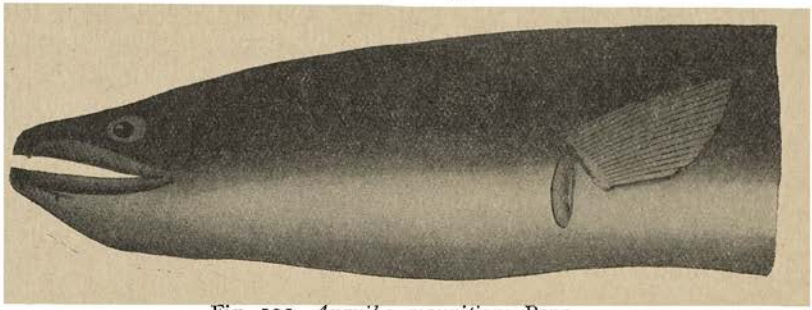

Fig. 102. *Anguilla mauritiana* Benn.

hindborder of eye or somewhat farther. The length of head is equal to its distance from dorsal and equal to or shorter than the distance between dorsal and anal. Pectorals have 16—18 (after BLEEKER 22—24) rays and go $2^1/_2$—3 times in the length of head. Snout broader at its base than its length. Tail longer than head and trunk. Intermaxillary and vomerine teeth forming a rhombic band with slightly concave sideborders; posteriorly rapidly tapering into a point, which does not reach so far as the maxillary teeth. The maxillary teeth arranged in two outer series, the inner one of which carries the longest teeth, which border an edentulous longitudinal groove. Inward of this groove there are about 3 series of teeth opposite to the vomerine band but separated from it by a groove. These 3 series are posteriorly gradually reduced to one series. Mandibulary teeth outside the edentulous groove anteriorly in 2—3 series, of which the inner one has the largest teeth, which are continued posteriorly. Inside of the groove there are anteriorly several series of teeth, tapering posteriorly into one series. In alcohol-specimens ventral surface light, dorsal surface dark, especially the last with different large spots. Length more than 1600 mm.

Nom. indig.: Mowa (Malay. Batavia); Lubang (Sundan.); Ikan denong (Laut Tawar).

Habitat: Sumatra (Laut Tawar! [Atjeh]; Lake of Manindjau!, Padang); Simalur!; Nias!; Java (Batavia, Buitenzorg, Tjibulus, Perdana, Tjibiliong, Kowawang, Tjitjurup, Tjitarik, Kuningan, Djember!); Borneo; Bali; Lombok; Sumbawa; Flores!; Timor up to 700 and 900 M.!; Wetter; Babber!; Celebes (Makassar, Lake of Tempe!, Dongala!, Lake of Posso!, Menado, Tondano, Klabat di Atas); Saleyer!; Togian Islands; Buru!; Ambon!; Ceram!; Nusa Laut!; Batjan; Ternate; Halmahera; Rawak; New Guinea (rivers Mamåpiri!, Klipong!, Tawarin!, near Humboldt Bay!, German New Guinea). — Westpacific Islands; River Mary in South Australia; Honkong; Philippines; Formosa; Andaman Islands; Ceylon; Mauritius; Johanna Island; Natal; Mossambique; Zanzibar; German East-Africa [1]).

3. **Anguilla celebesensis** Kp. [Fig. 99, 101 on p. 243, 244].

? *Anguilla aucklandi* Richardson, Voy. Erebus & Terror, vol. II. 1844, p. 112.
Anguilla celebesensis Kaup, Cat. Apodal Fish, 1856, p. 42.
Anguilla megastoma Kaup, Ibid. p. 50.
Anguilla otaheitensis Kaup, Neue Aalähnl. Fische, Hamburg 1859, p. 17.
Muraena celebesensis Bleeker, Atl. Ichth. vol. IV. 1864, p. 115.
Anguilla amboinensis Peters, Monatsber. Akad. Berlin, 1866, p. 523.
Anguilla aneitensis Günther, Cat. Brit. Mus. vol. VIII. 1870, p. 34.
Anguilla obscura Günther, Proc. Zool. Soc. London, 1871, p. 673.
Anguilla amboinensis Klunzinger, Sitzber. math.-naturw. Cl. Akad. Wien, vol. XXX. 1879, p. 419.
Anguilla amboinensis A. B. Meyer, Anal. Soc. Espan. Hist. nat. vol. XIV. 1885, p. 43.
Anguilla delalandi Sauvage, Poissons de Madagascar, 1891, p. 493.
Anguilla latirostris Popta, Notes Leyden Mus. XXVII. 1905 (1906) p. 210 (nec Risso).
Anguilla megastoma Jordan & Seale, Bull. Bur. Fish, XXV. 1906, p. 192.
Anguilla megastoma Seale, Occ. Papers Bishop Museum, vol. IV. 1906, p. 5.
Anguilla otaheitensis Günther, Fische d. Südsee, vol. III. 1910, p. 390.
Anguilla aneitensis Günther, Ibid. p. 391.
Anguilla obscura Günther, Ibid. p. 392.
Anguilla aneitensis M. Weber, Senckenb. Naturf. Ges. vol. XXXIV. 1911, p. 22.
Anguilla otaheitensis Kendall & Goldsborough, Mem. Mus. Comp. Zool. Harvard College vol. XXVI. 1907, p. 244.
Anguilla celebesensis Max Weber, Zoolog. Jahrb. Suppl. XV. Bd. 1, 1912, p. 585.

According to the length, height 14—19, head 7.4—8.6. Eye 6.6 (in young)—13.5, 1.3—2.3 in interorbital space, 1.1—2.5

1) GÜNTHER cites also Almorak in the mountainous part of British India, but as this statement is based on a dried skin, doubt is not excluded.

in snout, which goes 4—5.7 in length of head. Gape of mouth 2.4—4 in head, reaching in young specimens nearly to hindborder of eye, in older ones to the hindborder of the eye or half diameter of eye behind it. Head shorter than its distance from dorsal, shorter than or equal to half its distance from anus and a little longer or shorter than the distance between origin of dorsal and anal. Pectorals 2.7—4 in head. Breadth of snout at base equal to or a little more than its length. Tail longer than head and trunk. The intermaxillary and vomerine teeth forming a band, which — so far as it is in reach of the maxillary teeth — gradually tapers posteriorly from 17—18 rows of teeth anteriorly to about 7 rows posteriorly. There upon it often tapers abruptly and ends lancet-shaped, at a distance of $^1/_6$ of its length or less from the level of the end of the maxillary band of teeth. These teeth form a band of 10—16 rows anteriorly, which only slightly tapers posteriorly. It is narrower than the vomerine band and separated from it by a groove. The mandibulary band of teeth is alike. Colour of alcohol specimens light below, back and flanks dark brown, clouded with darker. Length 1500 mm.

Nom. indig.: Měngaling (Bŏ); Roar (Isl. Roon).

Habitat: Simalur!; Nias!; Borneo (river Bŏ); Celebes; Ambon; Buru; Ceram; Salibabu!; Nusa Laut!; Timor!; Kei-Islands!; Island Roon in Geelvink Bay!; New Guinea! [Brit. Mus.]. — Pacific Islands, Philippines, Port Philip (Australia).

4. **Anguilla malgumora** Kaup.

Anguilla malgumora Kaup, Cat. Apodal Fish, 1856, p. 42 (nec Schlegel, Mus. Lugd. Batav.).

Anguillà malgumorà Max Weber, Zoolog. Jahrb. Suppl. XV. Bd. 1, 1912, p. 588.

Height 14.7, head 7.8. Eye 6.6, nearly once in interorbital space and 1.3 in snout, which goes 5.2 times in head. Mouth-opening 3.5 in head and reaches vertical through hindborder of pupil. Head shorter than its distance from dorsal and somewhat shorter than half its distance from anal and only slightly longer than the distance of the origin of the dorsal from that of the anal. Pectoral goes 2.6 times in length of head. Tail about $^1/_3$ of its own length longer than body.

According to KAUP's figure the pointed vomerine band of teeth reaches farther posteriorly as the maxillary band of teeth, which ends also pointed; the maxillary and mandibulary band

of teeth are both without an edentulous longitudinal groove. Olive green above, sides silvery, ventral surface yellowish white. Length of single known specimen 575 mm. [After KAUP and kind information of Dr. PELLEGRIN of the Paris Museum].

Habitat: Borneo (the single known specimen in the Paris Museum).

5. Anguilla spengeli M. Web.

Anguilla malgumora Schlegel, (Museum Lugd. Batav.).
Anguilla mowa Bleeker, Verh. Bat. Gen. vol. XXV. 1853, Muraenoiden, p. 16 (p.p.).
Muraena malgumora Bleeker, Atl. Ichth. vol. IV. 1864, p. 11 (nec Kaup).
Anguilla (Muraena) malgumora Kner, Novara Exp. I. Fische 1865—1867, p. 367 (nec Kaup).
Anguilla spengeli Max Weber, Zoolog. Jahrb. Suppl. XV. Bd. 1, 1912, p. 591.

Height about 17—18, head $6^4/_5$—8. Eye $5^4/_5$—7, $1^1/_3$—$1^1/_2$ in interorbital space, touches the maxillary, only slightly shorter than the snout, which goes 5—$5^1/_2$ times in head. Gape of mouth $3^1/_3$—4 in head, reaching to middle of eye or to hinder-half of pupil. Length of head about twice in its distance from anus; origin of dorsal is situated at a very short distance before it [1]). Pectorals about $2^1/_3$—$2^2/_3$ in head. Snout shorter than broad at its base. Tail only $^1/_4$ or $^1/_5$ of its length longer than head and trunk. Teeth equal, those in the upper jaw in two broad bands, which do not much taper posteriorly. They are scarcely separated by an indistinct interspace from the broad vomerine band of teeth, which scarcely tapers posteriorly and reaches as far as the maxillary bands. Bands in the upper jaw also broad, not much tapering posteriorly. Any trace of a longitudinal edentulous groove is missing. Light below, dark above. Length about 600 mm.

Habitat: Simalur!; Nias!; Java (Batavia, Tjikandi); Borneo (Balik Papan!). — Australia, according to KNER, without nearer specification of habitat.

6. Anguilla australis Rich.

Anguilla australis Richardson, Proc. Zool. Soc. London, 1841, p. 22. — Trans. Zool. Soc. London, vol. III. 1849, p. 157. — Voy. Erebus & Terror, Prt. 2, Fishes, 1844, p. 112.

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1) We have a specimen of 320 mm. length from the Island Simalur, collected by Mr. E. JACOBSON, in which the origin of the dorsal is 8 mm. behind the anus. This is also the case in *Anguilla dussumieri* Kaup, but in that species the eye is much smaller and far before the corner of the mouth.

Anguilla australis Jenyns, Zoology Voyage "Beagle", vol. IV. Fish, 1842, p. 142.
? *Anguilla bicolor* McClelland, Calcutta Journ. Nat. Hist. vol. V. 1845, p. 178.
Anguilla macrocephala Rapp, Jahreshefte Ver. Vaterl. Nat. Württemberg, vol. IV. 1849, p. 142.
Anguilla moa Bleeker, Verh. Bat. Gen. vol. XXIII. 1850, p. 22 (p.p.).
Anguilla virescens Peters, Monatsber. Akad. Berlin, 1852, p. 684.
Anguilla sidat Bleeker, Verh. Bat. Gen. vol. XXV. 1853, p. 17.
Anguilla marmorata Kaup, Cat. Apodal Fish, 1856, p. 43 (nec Quoy & Gaimard).
Anguilla mowa Kaup, Ibid. p. 51.
Anguilla bleekeri Kaup, Ibid. p. 52.
Anguilla cantori Kaup, Ibid. p. 52.
Anguilla malabarica Kaup, Ibid. p. 52.
Anguilla australis Kaup, Ibid. p. 53.
Anguilla australis Bleeker, Nat. Tijdschr. Ned. Indië, vol. XIII. 1857, p. 389.
Muraena halmaherensis Bleeker, Ned. Tijdschr. Dierk. vol. I. 1863, p. 159.
Muraena sidat Bleeker, Atl. Ichth. vol. IV. 1864, p. 10.
Muraena moa Bleeker, Ibid. p. 11.
Muraena australis Bleeker, Ibid. p. 12.
Muraena halmaherensis Bleeker, Ibid. p. 12.
Anguilla sidat Kner, Novara-Reise, Fische, 1865—1867, p. 368.
Anguilla moa Kner, Ibid. p. 369.
Anguilla virescens Peters, Reise nach Mossambique, Flussfische, 1868, p. 101.
Anguilla bicolor Günther, Cat. Brit. Mus. vol. VIII, 1870, p. 35.
Anguilla virescens Günther, Ibid. p. 35.
Anguilla sidat Günther, Ibid. p. 36.
Anguilla australis Günther, Ibid. p. 36.
Anguilla bicolor Day, Fishes of India, 1878—1888, p. 660.
Anguilla australis Douglas Ogilby, Cat. Fish. N. S. Wales, 1886, p. 58.
Anguilla bicolor, Vinciguerra, Ann. Mus. Civ. Genova (2), vol. IX. 1890, p. 358.
Anguilla virescens Pfeffer, Ostafrikan. Fische, gesamm. von Stuhlmann, Jahrb. Hamb. Anst. vol. X. 1893, p. 41.
Anguilla virescens Pfeffer, Die Fische Ost-Afrikas, 1896, p. 71.
Anguilla sidat Jordan & Seale, Bull. Bur. Fish. XXV. 1906, p. 192.
Anguilla australis Jordan & Seale, Ibid. p. 192.
Anguilla australis Max Weber, Abh. Senckenberg. Nat. Ges. vol. XXXIV. 1911, p. 21. — Zoolog. Jahrb. Suppl. XV. Bd. 1, 1912, p. 594.
Anguilla australis Boulenger, Cat. Fresh-water fishes Africa. III. 1915, p. 9.

According to length, height 16—17, head 7.3—8.5. Eye 8—10, 1.5—2.8 in interorbital space and 1.2—2.1 in snout, which goes 6—8 times in length of head. Gape of mouth 3.5—4 times in length of head, reaching to hindborder of eye or somewhat farther. Head 2—$2^2/_3$ in its distance from anus (or from dorsal). Pectorals $2^2/_3$—$3^1/_2$ in length of head. Snout shorter than broad at its base. Tail longer than head and body. The intermaxillary and maxillary teeth form a continuous band of many rows of small, nearly equal teeth, tapering posteriorly. The maxillary teeth are without limit but in close connection with

the similar vomerine teeth, which form an elongate pearshaped band, the point of which reaches in young specimens as far as, in old ones somewhat farther backwards than the maxillary band. Mandibulary band with equal teeth, anteriorly broad, tapering posteriorly. Alcohol specimens with the belly, pectorals and anal light, otherwise more or less dark and not spotted. Length to about 1000 mm.

Nom. indig.: Mowa (Malay. Batavia); Sidat (Javan.); Olling (Sundanese name for young specimens), Lara (Sundanese for fullgrown specimens), Sawalī Luntjah (Simalur).

Habitat: Pulu Weh (Sabang)!; Sumatra (Siboga, Padang, Priaman, Benkulen, Batu Sangkar, Deli!, Sungi Mahe (Upper Langkat); Kota radja (Oleleh, Atjeh!); Simalur!; Nias!; Java (Batavia, Tjampea, Buitenzorg!, Bekassi!, Tjikandi, Bantam, Perdana, Tjibiliong, Leles, Banjumas, Ambarawa, Palabuan Batu, Dirk de Vries Bay); Bali; Lombok!; Sumbawa; Flores!; Timor!; Aru Islands!; Borneo; Celebes (North Celebes, Menado, South eastern Celebes); Batjan!; Halmahera; South New Guinea (Lorentz river!, Rigo in British New Guinea). — Samoa, Tahiti, Auckland Island, New Zealand, Tasmania, South Australia, New South Wales, Burma, Malabar, Andamans, Bombay, Ceylon, German East Africa, Mossambique, Natal.

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2. Fam. CONGRIDAE.

Elongate, more or less compressed. Anus far behind gill-openings, in anterior half of length. Scaleless; lateral line present. Dorsal, anal and caudal confluent. In indo-australian genera the origin of the dorsal is above or somewhat before or behind the gillopenings and the pectorals are well developed. Snout produced, the ethmoid with intermaxillary plate being prominent in different degrees beyond the articulation with the maxillaries. Cleft of mouth reaching behind eye. Tongue free or not. Eye moderate or large. Posterior nostrils close to or near eye, the anterior nostrils tubulate or not, close to tip of snout and lateral. Teeth on vomer and jaws in one or more series or bands, differing in size and form. Gillopenings narrow or wide, more or less ventrally, separated by an isthmus to which the gillmembranes are attached. Branchial openings in pharynx are wide slits.

Distribution: Marine, in brackish or fresh water; costal, in aestuaries or bathypelagic, all over the world in warm and temperate seas.

Artificial key to the indo-australian genera of Congridae.

I. Canine teeth in frontpart of jaws and on vomer . . . *Muraenesox* p. 252.
II. No canine teeth.
1. Anterior nostrils in a tube.
a. Teeth equal, outer series of teeth so closely set as to form a cutting edge. . . . . *Conger* p. 257.
b. Teeth unequal; not so closely set as to form a cutting edge. . . . . *Congrellus* p. 260.
2. Anterior nostrils not tubulate.
a. Dorsal beginning above base of pectorals or farther behind. Tail strongly tapering. Colour uniform. *Uroconger* p. 264.
b. Dorsal beginning at some distance before gill-openings. Tail normal. Body banded, head with dark blotches.. . . . . *Poeciloconger* p. 266.

1. **Muraenesox** Mc Clelland.

(Mc CLELLAND, Calcutta Journal Natural History IV. 1843, p. 408).

Elongate, anteriorly subcylindrical, posteriorly compressed. Anus in the anterior half of the length. The origin of the dorsal before or above the gillopenings. Dorsal, anal and caudal confluent. Pectorals well developed. Head elongate. Snout produced. Upper jaw prominent, conical, its tip rounded, somewhat broadened and somewhat separated by a notch from the rest of the snout. Eye large, oval, covered by skin, without a free orbital margin. Posterior nostrils opposite to middle of eye but distant from it and separated by about the same distance from the anterior nostrils, which are shortly tubulated and situated behind the notch of the snout. Mouth wide, extending far behind the eye. Tongue not free. Maxillary teeth conical, in several rows, partly separated by an edentulous interspace. Mandibulary teeth conical, in several rows, the outer of which may be pointing outwards, the anterior teeth are caniniform. Teeth of intermaxillary plate more or less caniniform, followed by several long series of teeth on the vomer, the middle of which is formed by large conical or compressed

teeth. No scales. Lateral line present. Gillopenings rather wide, beginning opposite to the upper margin of the base of the

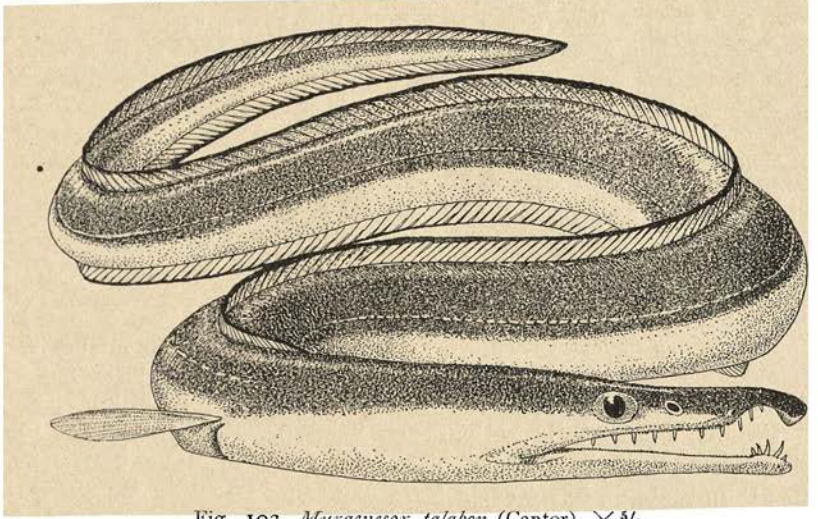

Fig. 103. *Muraenesox talabon* (Cantor). × 5/8.

pectorals and separated from each other by a narrow interspace.

Distribution: Found in all warm seas.

Key to the indo-australian species of Muraenesox.

1. Outer row of the teeth in the mandibles not directed outwards. Median canines of vomer with distinct anterior and posterior basal lobes . . . . . *M. cinereus* p. 253.
2. Outer row of teeth in the mandibles directed outwards. Median canines of vomer at most with an indication only of basal lobes.
   a. Pectorals about 3 in head . . . . . *M. talabon* p. 255.
   b. Pectorals 4 or more in head. . . . . *M. talabonoides* p. 256.

1. **Muraenesox cinereus** (Forsk.).

Muraena cinerea Forskål, Descript. animal. 1775, pp. X, 22.
Muraena arabica Bloch, Schneider, Syst. Ichth. 1801, p. 488.
Muraena bagio Hamilton Buchanan, Fish. Ganges 1822, p. 364.
Conger longirostris Bennett, Life of Raffles, 1830, p. 692.
? *Conger oxyrhynchus* Eydoux & Souleyet, Voy. Bonite, 1841, I. p. 203.
Muraenesox tricuspidata McClelland, Calcutta Journ. Nat. Hist. IV. 1844, p. 409.
Muraenesox hamiltoni McClelland, Ibid. V. 1845, p. 182.
Muraenesox bengalensis McClelland, Ibid. V. 1845, p. 182, 210.

Ophisurus rostratus Quoy & Gaimard, Voy. Uranie, 1846, p. 242.
Congrus tricuspidatus Richardson, Voy. Sulphur, Fish. 1846, p. 105.
Conger hamo Schlegel, Fauna Japon. Poiss. 1846, p. 262.
Conger bagio Bleeker, Nat. Tijdschr. Ned. Indië, III. 1852, p. 777.
Conger singapurensis Bleeker, Verh. Batav. Genootsch. XXV. 1855, Muraenoiden, p. 21.
Murdenesox bagio Kaup, Catal. Apodal fish. 1856, p. 116.
Muraenesox bagio Bleeker, Atl. Ichth. IV. 1864, p. 24.
Muraenesox singapurensis Bleeker, Atl. Ichth. IV. 1864, p. 25.
Muraenesox singapurensis Kner, Fische Novara-Exp. 1865—1867, p. 371.
Muraenesox bagio Kner, Ibid., p. 373.
Muraenesox cinereus Günther, Cat. Brit. Mus. VIII. 1870, p. 46.
Muraenesox cinereus Klunzinger, Verh. Zool. botan. Gesellsch. Wien, XXI. 1871, p. 608.
Muraenesox cinereus Day, Fish. India 4°. 1878—1888, p. 662.
Muraenesox cinereus Jordan & Snyder, Proc. U. S. Nat. Mus. XXIII. 1901, p. 857.
Muraenesox cinereus Günther, Fische d. Südsee, Heft IX. 1910, p. 395.
Muraenesox cinereus Seale, Philippine Journ. of Sc. V. No. 4, 1910, p. 265.

Height more or less than 20; head 6—7. Anus about in the beginning of the third fifth of the length. Eye 8—10 in head and about 4 times in snout. Teeth in upper jaw in three series, the inner one curved and separated by an edentulous interspace from the 2 other series of which the inner one has by far the largest teeth, which are compressed. In the lower jaw 3 series of teeth, an inner shorter, irregular one with small teeth, a middle one with large compressed and an outer one with small teeth. The middle one of each side ending near the symphysis with a large canine, round which the outer series is produced with six or seven large teeth. Intermaxillary plate with a group of about 8—10 canines, followed on the vomer by a median row of about 10—15 compressed teeth, the posterior ones of large size, with a basal lobe in front and behind. At

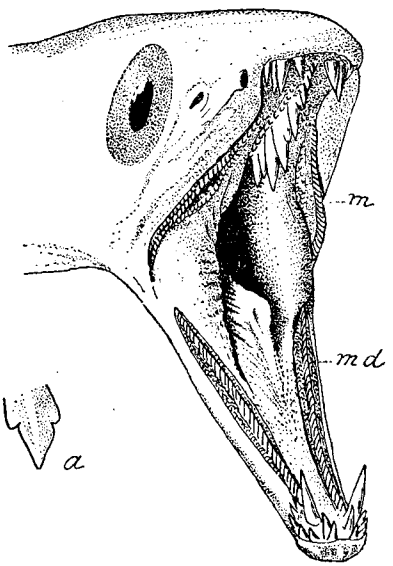

Fig. 104. Opened mouth of *Muraenesox cinereus* (Forsk.). Outer series of *m* maxillary, *md* of mandibulary teeth. — *a* single tooth of vomer. × 1¾.

each side of the median row a lateral row of smaller teeth. Dorsal commencing above gillopenings, its height about half height of body. Pectorals about 3 times in length of head. Colour of alcohol specimens gray, sides silvery, median fins with a broad black margin. Length more than 800 mm.

Nomen indig.: Putje-Kanipa (Malay. Batavia); Manglong (Upper Riko, East Borneo); Majong (Bagan Api Api).

Habitat: Sumatra (Telok Betong, Priaman, Bagan Api Api!); Singapore; Bintang; Java (Batavia, Pasuruan); Borneo (Singkawang, Kota Baru!; Upper Riko near Balik Papan!, Sandakan, Sarawak); Celebes (Makassar!, Badjoa, North Celebes); Flores!, Waigeu; Aru-Islands!; South New Guinea. — Pinang, Philippines, China, Japan, Australia, West Pacific Islands, Indian Ocean, Red Sea, East Coast of Africa. In sea, brackish and fresh water.

2. **Muraenesox talabon** (Cantor) [Fig. 103, 105 on p. 253, 256].

? (*Ophidium*) *Tala Bon* Russell, Fishes of Vizagapatam I. 1803, p. 27.
Conger (*Muraena*) *talabon* Cuvier, Règne animal. 2. édit. p. 350 (name only after Russell).
? *Muraenesox lanceolata* McClelland, Calcutta Journ. Nat. Hist. IV. 1844, p. 409.
? *Muraenesox exodon* McClelland, Ibid. p. 409.
? *Muraenesox serradentata* McClelland, Ibid. p. 409 and V. 1845, p. 210.
? *Muraenesox exodentata* McClelland, Ibid. V. 1845, p. 180 & p. 210.
Conger talabon Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 1294.
Conger talabon Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 78 (p. p.). — Ibid. V. 1853, p. 456. — Verh. Batav. Genootsch. XXV. 1853, Muraenoiden, p 18.
Muraenesox pristis Kaup, Cat. Apodal fish. 1856, p. 116.
Muraenesox talabon Bleeker, Atl. Ichth. IV. 1864, p. 22.
Muraenesox talabon Kner, Novara-Exped., Fische, 1865—1867, p. 372.
Muraenesox talabon Günther, Cat. Brit. Mus. VIII. 1870, p. 45.

Height 17—25; head more or less than 6. Anus about in the beginning of the third fifth of the length. Eye 9—11 in head and about thrice in snout. Teeth in the upper jaw in three series, the inner one curved and separated by an edentulous interspace from the two outer ones, of which the inner one has by far the larger teeth. Teeth in the mandibles in three rows, the outer row separated by an edentulous interspace from the others, those of the inner row very small, the middle row close set and ending at the symphysis in about 5 strong canines; those of the outer row close set behind, but apart, pointed and directed outward in the first half of the jaw. Intermaxillary plate with about 8 canines, followed on the

vomer by a row of about 12 strong conical canines, the posterior of which may have an indication of basal lobes. At each side of this median row a row of small compressed teeth. Dorsal beginning a little before the gillopenings, its height less than half height of body. Pectorals about thrice in head. Colour of preserved specimens grayish brown above, white below, fins light, the vertical ones with a black border. Length 1500 mm.

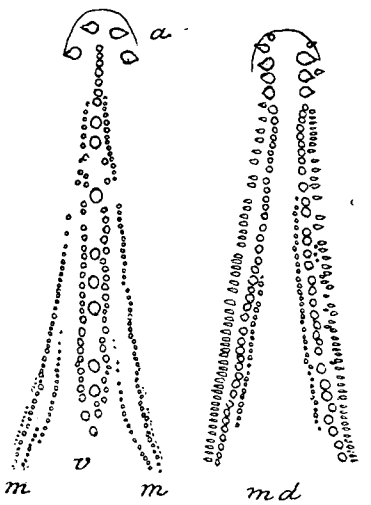

Fig. 105. Dentition of *Muraenesox talabon* (Cantor). *a* intermaxillary, *m* maxillary, *md* mandibulary, *v* vomerine teeth; the mandibulary teeth with an outer series of horizontal ones. × 1 3/4.

Nom. indig.: Putje-kanipa (Malay. Batavia); Remang (Javanese); Tilan Laut (Bagan Api Api).

Habitat: Sumatra (Bagan Api Api!); Nias; Singapore; Java (Batavia, Tegal, Samarang, Surabaya, Pasuruan); Madura; Borneo (Pamangkat, Balik Papan!); Celebes (Makassar). — Malacca, Andamans, British India, Cochin and China.

3. **Muraenesox talabonoïdes** (Blkr.).

Conger talabonoïdes Bleeker, Verh. Bat. Gen. XXV. 1853, Muraenoiden, p. 20.
Muraenesox talabonoides Bleeker, Atl. Ichth. IV. 1864, p. 23.
Muraenesox talabonoides Günther, Cat. Brit. Mus. VIII. 1870, p. 46.
Muraenesox telabonoides Day, Fishes of India 4°. 1878—1888, p. 662.

Height about 20. Head about 6. Anus about in the beginning of the third fifth of the body. Eye 10, 3.5 in snout. Maxillary teeth in three rows, the inner one curved and irregular, separated by an edentulous interspace from the two other rows, the inner of which has by far the longer teeth. Teeth in the mandibles in four rows: an inner row of very small ones followed by a second row of longer pointed ones; this row is bordered at the outer side by a third shorter irregular row of small teeth; an outermost row consists of long pointed distant teeth, directed outwards. At the symphysis the second row ends in a strong canine, round which the fourth row is conti-

nued with about 6 canines on each side. Intermaxillary plate with about 10 canines, followed on the vomer by a median row of about 18 teeth, the first eight of which are small, the others being large, conical pointed canines. On each side of

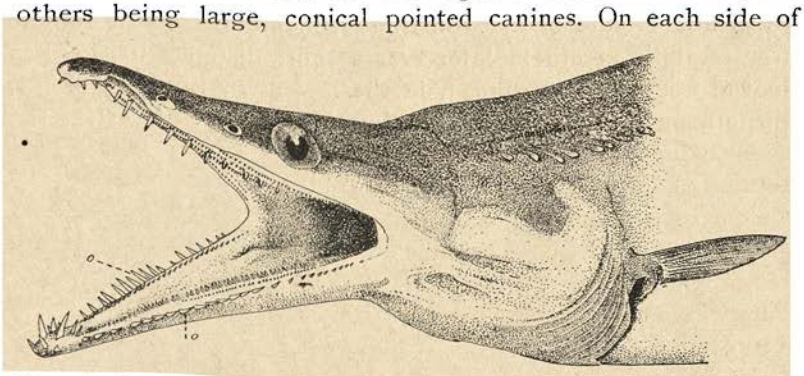

Fig. 106. *Muraenesox talabonoides* (Blkr). × 1/2. *o* outer series of horizontal teeth.

the median row a row of short compressed teeth. Dorsal beginning above the gillopenings. Pectorals 4 times or more in head. Bluish gray above, light below. Vertical fins with a black border. Length more than 1000 mm.

Nom. indig.: Putje kanipa (Malay. Batavia).

Habitat: Java (Batavia); Borneo (Balik Papan!). — British India.

2. Conger Cuvier.

(Cuvier, Règne animal, 2. ed. II. 1829, p. 350).

Very elongate, anteriorly subcylindrical, posteriorly compressed. Anus in anterior half of the length. The origin of the

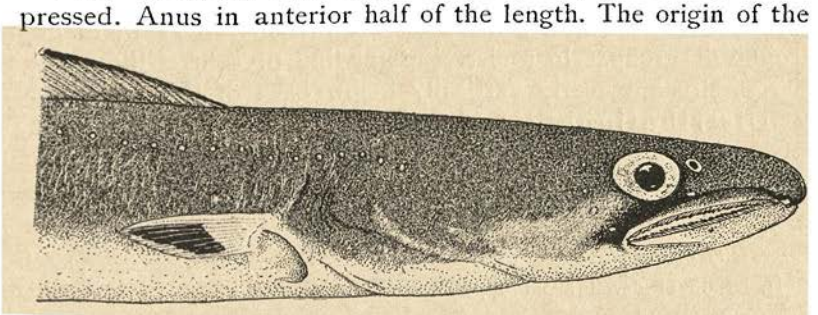

Fig. 107. *Conger cinereus* Rüpp. × 4/3.

dorsal situated shortly behind the root of the pectorals. Dorsal, anal and caudal confluent. Pectorals well developed. Head moderate, conical, somewhat depressed. Eyes large, covered

by skin, without free orbital margin. Posterior nostrils opposite to the upper or middle part of the eye, the anterior in a tube close to the tip of the snout. Mouth wide, extending at least to below middle of eye. Lips large, membranaceous. Tongue free. Anterior teeth in jaws over a short distance irregularly, in the upper jaw in 2 to 3, in the lower jaw in 3 to 4 series; posteriorly in upper and lower jaw in one or two series: the

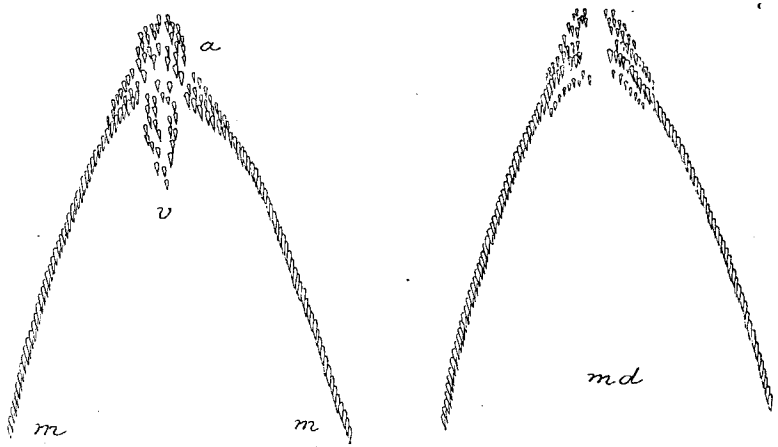

Fig. 108. Dentition of *Conger cinereus* Rüpp.
a intermaxillary, *m* maxillary, *md* mandibulary, *v* vomerine teeth. × 3.

inner series, which may be incomplete or even absent, with small, conical teeth, in the outer series the equal teeth are compressed and so closely set as to form a cutting edge. Vomerine teeth arranged in a short conical group, the point of which is directed backward; those on the intermaxillary plate in a roundish group. No scales. Lateral line present. Gillopenings large, situated nearly vertically below base of pectorals.

Distribution: Seas of temperate and tropical regions.

Key to the indo-australian species of Conger.

I. Origin of dorsal conspicuously in advance of the extremity of the pectorals . . . . . *C. cinereus* p. 258.

II. Origin of dorsal about opposite to the extremity of the pectorals . . . . . *C. conger* p. 259.

1. Conger cinereus Rüpp.

Conger cinereus Rüppell, Atlas Reise nördl. Afrika, Fische des Rothen Meeres, 1828, p. 115.

Conger marginatus Valenciennes in Eydoux & Soul. Voyage Bonite, Zoologie, 1841, p. 201.
Conger altipinnis Kaup, Archiv für Naturgeschichte XXII. 1856, p. 72. — Cat. Apodal Fish 1856, p. 114.
Conger Noordzieki Bleeker, Act. Soc. Scient. Ind. Neerl. II. 1857. Achtste Bijdr. vischfauna Ambon, p. 86. — Atl. Ichth. IV. 1864, p. 26.
Conger marginatus Günther, Cat. Brit. Mus. VIII. 1870, p. 38.
Conger cinereus Klunzinger, Verhandl. Zool. Bot. Ges. Wien XXI. 1871, p. 607.
Leptocephalus nystromi Jordan & Snyder, Proc. U. S. Nat. Mus. XXIII. 1901, p. 853.
Leptocephalus marginatus Jordan & Evermann, Bull. U. S. Fish. Comm. XXIII (1903) 1905, p. 76.
Conger marginatus Günther, Fische der Südsee, Journ. Mus. Godeffroy, 1910, p. 393.
Conger cinereus Max Weber, Siboga-Exp. Fische, 1913, p. 43.

Subcylindrical, posteriorly compressed. Head somewhat depressed, its profile nearly straight. Height about 20, head about 9. Tail less than twice length of head and trunk. Eye $5^1/_2$, longer than high, nearly $1^1/_2$ in snout and nearly $^1/_3$ longer than interorbital space. Jaws equal or the upper one slightly prominent. Mouthopening reaching conspicuously behind middle of eye. Posterior nostrils slightly before eye, somewhat below the level of its upper border. Dorsal commencing above or somewhat behind the middle of the pectorals. Pectorals $2^1/_2$—3 in length of head. Grayish, lower surface lighter. Vertical fins edged with black. Pectoral fins in adult specimens frequently with a black spot (perhaps in males). Young specimens in life with an indication of crossbands. Length nearly 1000 mm.

Nom. indig.: Navia (New Guinea, Hood bay).

Habitat: Sumatra (Benkulen); Java (Prigi, Patjitan); Celebes (Badjoa); Flores; Pulu Serbete!; Timor; Ambon; Nusa Laut!; Batjan; Ternate!; New Guinea (Humboldt bay!, Hood bay). — New Caledonia, Lord Howe Island, Samoa islands, Sandwich islands, Japan, Red Sea, East Coast of Africa, Mauritius, Bourbon.

2. Conger conger (L.).

Muraena conger Linné, Syst. nat. ed. X. 1758, p. 245.
Conger vulgaris Cuvier, Règne anim. 2. ed. II. 1829, p. 350.
Conger vulgaris Bleeker, Atl. Ichth. IV. 1864, p. 26.
Conger vulgaris Günther, Cat. Brit. Mus. VIII. 1870, p. 29 (s. syn.).

Subcylindrical, posteriorly compressed. Height 17 to 22, head 7—9. Tail less than twice length of head and trunk. Eye $5^1/_2$—9, about twice in snout. Jaws nearly equal, the upper jaw somewhat longer. Posterior nostrils on a level with the anterosuperior angle of the orbit. Mouthopening reaching conspicu-

ously behind middle of eye. Origin of dorsal opposite to or slightly behind extremity of pectorals. Pectorals $2^1/_2$—3 in length of head. Ashy gray or blackish, vertical fins with a black margin. Length of measured specimens from the Archipelago to 662 mm. [Specimen of BLEEKER's collection in the Leiden Museum seen by us].

Habitat: Batu-Islands; Java (Karangbollong, Patjitan); Celebes (Menado, Tanawangko); Solor; Letti. — Almost cosmopolitan, but not found in the Eastern Pacific.

3. **Congrellus** Ogilby.

(OGILBY, Proc. Linn. Soc. New South Wales, 1898, p. 286. — *Congermuraena* Kaup, Cat. Apodal fish 1856, p. 108, (p. p.). — *Congromuraena* Günther, Cat. Brit. Mus. VIII. 1870, p. 40, (p.p.). — *Ophisoma* (Swainson) Bleeker, Atl. Ichth. IV. 1864, p. 27 (p.p.)).

Very elongate, anteriorly subcylindrical, posteriorly compressed. Anus more or less before middle of length; origin of dorsal before, above or somewhat behind the base of the pectorals.

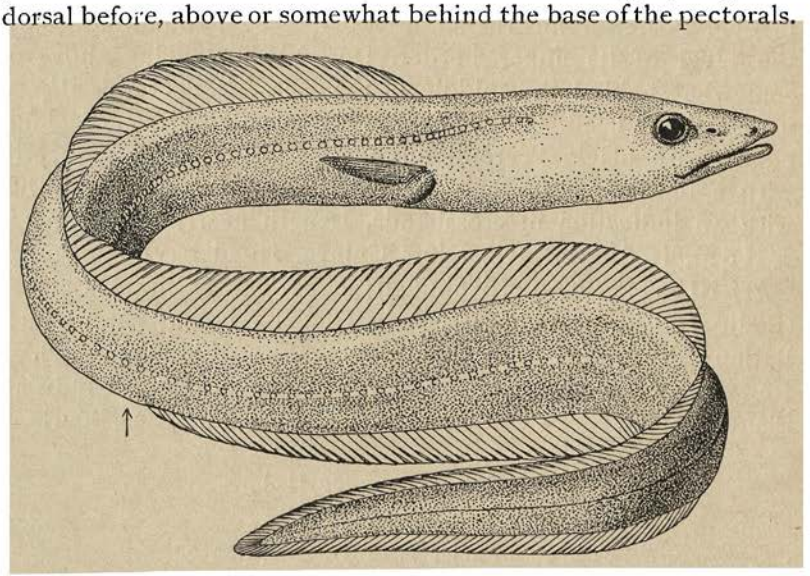

Fig. 109. *Congrellus anago* (Schlegel). × $1^1/_4$.

Dorsal, caudal and anal confluent. Pectorals well developed. Head moderate, conical, much shorter or longer than or equal to trunk; in its front part the bones with large muciferous cavities. The snout may be prominent. Eyes large, covered by skin, without free orbital margin. Posterior nostrils opposite

to middle of eye, anterior ones tubulate, close to the tip of the snout. Mouth wide, ending below posterior part of the eye or not so far. Lips rather thin or greatly developed. Teeth acute, in jaws in bands or in a few series, gaining in size posteriorly, not so closely set as in *Conger* and not forming a cutting edge. These series are increasing anteriorly into a band. On the vomer a short patch of larger teeth or a patch of small teeth,

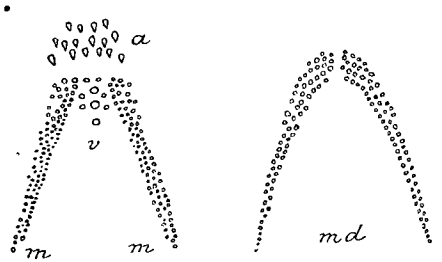

Fig. 110. Dentition of *Congrellus roosendaali* n. sp. × 2 1/2.

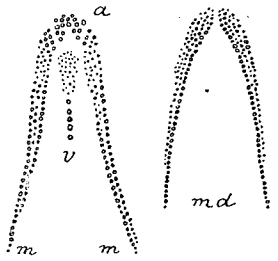

Fig. 111. Dentition of *Congrellus anago* (Schlegel). × 3.

a teeth on intermaxillary plate, *m* maxillary, *md* mandibulary, *v* vomerine teeth.

tapering into a rather long series of teeth, increasing in size. Teeth on the intermaxillary plate small or forming a patch of large teeth situated outside the mouth [1]). No scales. Lateral line present. Gillopenings ventrally far distant from each other, vertical, beginning below upper margin of base of pectorals, smaller than diameter of eye.

Distribution: Mediterranean, Western tropical and Southern Atlantic; Tropical Indic; Pacific from Japan to Hawaii and Fidji Islands.

Key to the indo-australian species of Congrellus.

1. Teeth on the intermaxillary plate enlarged, in a patch situated outside the mouth (*Bathycongrus* Ogilby) . . *C. roosendaali* p. 261.
2. Teeth on the intermaxillary plate not enlarged and situated inside the mouth (*Congrellus* Ogilby) . . . . *C. anago* p. 262.
   C. neoguinaicus p. 263.

1. **Congrellus roosendaali** n.sp. [Fig. 110, 112, p. 261, 262].

Height 14.6, head 6, 1.2 in trunk, head and trunk 1.5 in tail. Eye 5.8, half length of snout. Snout bluntly pointed, very

1) Perhaps it is possible to separate the species with the teeth on the intermaxillary plate extending forwards beyond the mandibles and lying outside the mouth as *Bathycongrus* Ogilby.

prominent, thrice in length of head. Cleft of mouth 3.4 in length of head, reaching to hindborder of pupil. Dorsal beginning shortly behind base of pectorals, its distance from the gill-openings more than twice in eye. Pectorals thrice in head. Teeth in jaws acicular, in rather broad bands of about three to four irregular series, the outer series somewhat enlarged, not forming a cutting edge. On the intermaxillary plate a rather broad patch of large teeth, situated outside the mouth;

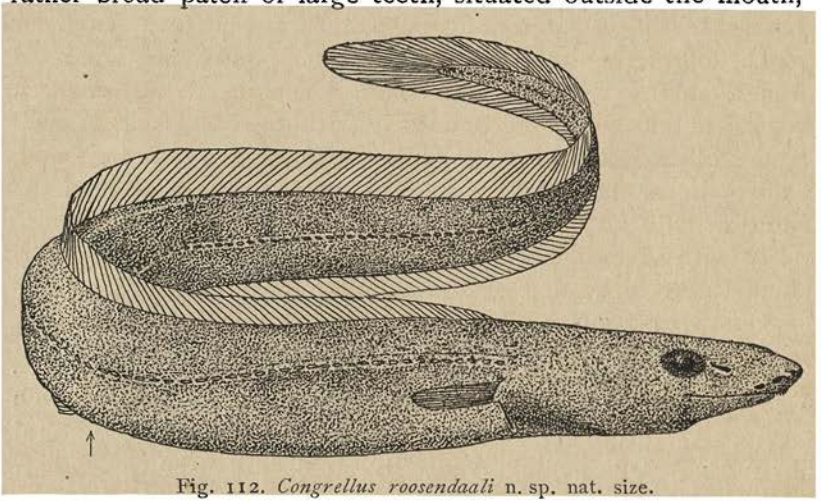

Fig. 112. *Congrellus roosendaali* n. sp. nat. size.

behind them and separated by an edentulous interspace, a small group of strong teeth anteriorly on the vomer. Colour in spirit light reddish brown, in a young specimen the dorsal and anal have a narrow black border, more conspicuous anteriorly. Length 250 mm. [Type of the species in the Zoological Museum of Amsterdam].

Habitat: Off Northeast point of Java. 270 M. depth. Collected by the Government Fisheries Investigation ship "Gier" September 6, 1909. Named after its commander A. M. VAN ROOSENDAAL.

2. **Congrellus anago** (Schlegel). Fig. 109, 111 on p. 260, 261].

Conger anago Schlegel, Fauna Japon. 1846, p. 259.
Conger anagoides Bleeker, Verh. Bat. Gen. XXV. 1853, Bijdr. Muraenoid. p. 76. — Nat. Tijdschr. Ned. Ind. VI. 1854, p. 112.
Ophisoma anagoides Bleeker, Atl. Ichth. IV. 1864, p. 27.
Congromuraena anagoides Bleeker, Atl. Ichth. IV. 1864, Plate V. fig. 3.
Ophisoma anagoides Kner, Fische Novara-Exp. 1865—1867, p. 375.

Congromuraena anago Günther, Cat. Brit. Mus. VIII. 1870, p. 42.
Congromuraena anago Day, Fish. India 4°. 1878—1888, p. 660.
Congrellus anago Jordan & Snyder, Proc. U. S. Nat. Mus. XXIII. 1901, p. 855.

Height 16—18; head 6—$6^1/_5$, $1^4/_5$ in trunk; tail but little longer than head and trunk. Eye large, 4—5, about as long as snout. Upper jaw somewhat prominent. Cleft of mouth reaching about middle of eye. Teeth acicular, not forming a cutting edge, the maxillary band anteriorly in 2 or 3, posteriorly in one or two series; teeth on intermaxillary plate arranged in a semilunar patch, completing anteriorly the maxillary bands but separated from them by a narrow interspace. Vomerine teeth forming a conical patch, beginning anteriorly with an oval group of small teeth, followed by a few bigger ones, forming a tapering band, ending in a single series and not reaching farther than the anterior half of the maxillary band. Mandibulary band anteriorly with several, posteriorly with one or two series. Pectorals about thrice in head. Dorsal beginning above base of pectorals or somewhat behind. Light or dark brownish. Vertical fins in specimens seen by us, without a broad black margin. Length more than 300 mm.

Nom. indig.: Ladu (Menado); Totodi (Batjan).

Habitat: Pulu Weh near Sumatra!; Singapore; Celebes (Menado); Ambon; Batjan; Banda; Moluccos in general!. — From coast of Coromandel to Malay Archipelago [Day]; Japan.

3. **Congrellus neoguinaicus** (Blkr.).

Conger neoguinaicus Bleeker, Act. Soc. Sc. Indo-neerl. VI. 1859, Bijdr. vischfauna N. Guinea p. 22.
Ophisoma neoguinaicum Bleeker, Atl. Ichth. IV. 1864, p. 28.
Conger neoguinaicus Günther, Cat. Brit. Mus. VIII. 1870, p. 43.
Conger neoguinaicus Bleeker, Arch. néerl. Haarlem XIII. 1878, p. 56.
Congermuraena neoguinaica J. D. Ogilby, Proc. Linn. Soc. N. S. Wales 1898, p. 286.

Only one specimen known, which when BLEEKER received it, was in a very bad state and is now preserved in the British Museum. According to BLEEKER it is distinguished from *C. anago* (Schlegel) by the jaws, which are of equal length, and having the vomerine teeth only in 2 rows and having a diffuse silvery longitudinal lateral band. GÜNTHER says l. c. p. 43: "*Conger neoguinaicus* Bleeker (Act. Soc. Sc. Indo-Neerl. VI. Nieuw Guinea, p. 22), or *Ophisoma neoguinaicum* Blkr. (Atl. Ichth. Mur. p. 28), is founded on an example so badly preserved that

no really distinctive characters can be pointed out. It is possible that it is identical with *C. habenata*." But OGILBY rightly remarked l. c. p. 286: "Dr. GÜNTHER's suggestion that this species " "may be identical with *C. habenata*" " cannot be accepted if BLEEKER is correct in describing the jaws as of equal length, the snout as $4^1/_2$ in the length of the head, and the vomerine teeth as biserial and " "bluntly conical" "; indeed, in view of the latter character, I am not fully satisfied that the species properly belongs to the present group."

4. Uroconger Kaup.

(KAUP, Cat. Apod. Fish 1856, p. 110).

Elongate, anteriorly subcylindrical, posteriorly compressed. Tail strongly tapering; anus in anterior half of the length. Origin of the dorsal beginning about above the base of the pectorals. Dorsal, caudal and anal confluent. Pectorals well developed. Head conical, depressed. Eyes rather large, covered by skin, without free orbital margin. Posterior nostrils a slit, situated near eye, below the level of its upper margin, the anterior ones near apex of snout, not tubular. Cleft of mouth of moderate width, extending to middle of eye or beyond it. Jaws unequal; lips moderate, membraneous, the upper one with

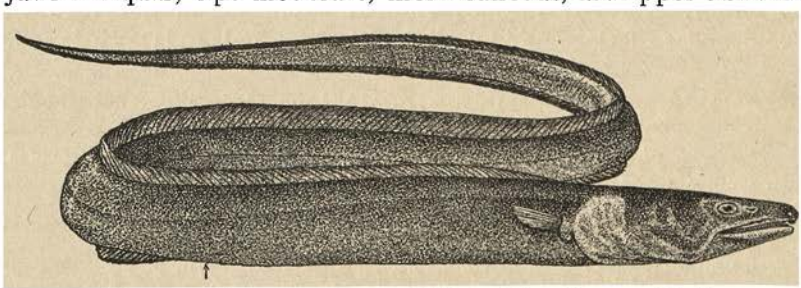

Fig. 113. *Uroconger lepturus* (Rich.). (After DAY, modified).

a row of short, slit-like pores. Tongue free. Teeth acicular, unequal, the maxillary ones in two distant series; the mandibulary teeth in two series, anteriorly with a short third inner row. The vomer with some large teeth in front, which may be followed by a series of smaller ones. On the intermaxillary plate the unequal teeth in 2 irregular series, an outer tooth may be enlarged. No scales. Lateral line present. Gillopenings large, situated vertically before and below base of pectorals.

Distribution: *Uroconger lepturus* inhabits the shallow seas

and coasts of the Indo-australian Archipelago, the Philippines, China Sea, Sea of Oman. There are also deep-sea forms known from Atlantic, Pacific and Indic.

Key to the indo-australian species of Uroconger.

Ventral distance of gillopenings equal to their width.
Height 20—23 in length. Pectorals with 9—11 rays . . . . *U. lepturus* p. 265.
Ventral distance of gillopenings greater than their width.
Height 12—13 in length. Pectorals with 17 rays . . . . . *U. braueri* p. 266.

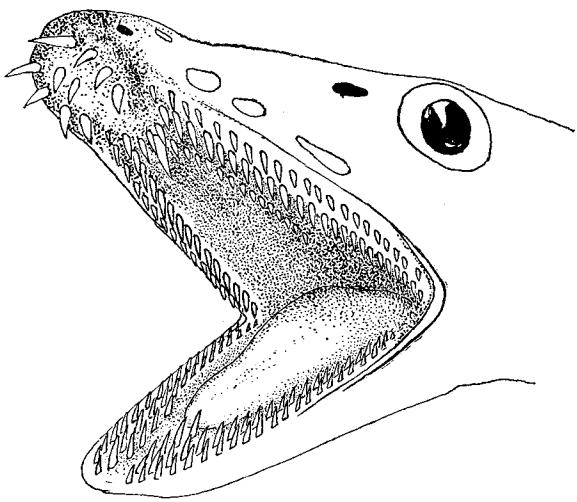

Fig. 114. Open mouth of *Uroconger lepturus* (Rich.). In the specimen drawn the duplification of the end of the single vomerine series was nor clearly visible.

1. Uroconger lepturus (Rich.).

Conger lepturus Richardson, Zoology Voyage Sulphur, 1844—1845, p. 106. — Voyage Erebus & Terror, Prt. II. Fishes 1844, p. 108.
Uroconger lepturus Kaup, Cat. Apodal Fish 1856, p. 110.
Conger lepturus Bleeker, Act. Soc. Sc. Indo-Neerl. III. 1858, Bijdr. Vischfauna Sumatra, p. 49.
Uroconger lepturus Bleeker. Atl. Ichth. IV. 1864, p. 29.
Uroconger lepturus Kner, Fische Novara 1865—1867, p. 373.
Uroconger lepturus Günther, Cat. Brit. Mus. VIII. 1870, p. 44.
Uroconger lepturus Day, Fishes of India 4°. 1878—1888, p. 661.

Height about 20—23$^1/_2$; head between 7 and 9, about 1.5 in length of trunk; tail twice to twice and a half as long as trunk, much tapering. Eye 5$^1/_2$—6$^1/_2$. Snout produced, depressed, 4 times in head. Cleft of mouth extending somewhat beyond the middle of the eye. Dorsal beginning above the base of

the pectorals; anteriorly half as high as height of body or less, posteriorly somewhat higher. Pectorals 3.5—about 4 in length of head, with 9—11 rays. For the teeth in the jaws see genus. On the intermaxillary plate an irregular group of 8—10, behind which about 2 pairs of teeth, followed on the vomer by a series of very small teeth, which is anteriorly a single, posteriorly a double one, reaching as far as about the inner series of the maxillary teeth. Ventral distance of gillopenings from each other equal to their width. Bluish-gray above, vertical fins edged with black. Length more than 300 mm. [A specimen from DAY's collection in the Leiden Museum seen by us].

Habitat: Sumatra (Siboga); Java; Celebes!. — Philippines, China Sea, Seas of India, Sea of Oman.

In shallow, costal water.

2. **Uroconger braueri** nov. nomen.

? *Uroconger vicinus* Alcock, Ann. Mag. Nat. Hist. X. 1892, p. 363. — Descript. Cat. of Ind. Deep-sea fish 1899, p. 200 (nec Vaillant).

Uroconger lepturus Brauer, Deutsche Tiefsee-Exp. Tiefseefische 1906, p. 124 (nec Richardson).

Height 12—16; head 7—7.5. Trunk more than $2^1/_2$ times in length of tail. Eye 6.2—7, in snout 1.7—1.9, 1.6 in interorbital space. Cleft of mouth extending to below middle of eye. Dorsal beginning nearly above base of pectorals. Pectorals less than half length of head, with 17 rays. For the teeth in the jaws see the genus. Teeth on intermaxillary plate in 2 series, the posterior series large; behind them on the vomer one or two large ones, at some distance followed by a small one, sometimes behind that an other small one on each side. Ventral distance of gillopenings from each other greater than their width. Lateral line very conspicuous, above it on nape and trunk short, black threads. Colour of alcohol specimens brownish, head and ventral surface bluish-black, somewhat viridescent.

Habitat: West coast of Sumatra in depths from 660—903 metres. — East coast of Africa in depths from 977—1019 metres. — [*U. vicinus* Alcock, Bay of Bengal (869 metres); Arabian Sea (786, 1063 metres)].

5. **Poeciloconger** Günther.

(GÜNTHER, Proc. Zool. Soc. London, 1871, p. 673).

Scaleless. Head pointed, without muciferous cavities. Cleft

of the mouth of moderate width, extending to below the eye. All the teeth villiform, forming bands. Pectoral and vertical fins well developed, the dorsal commencing in advance of the gillopenings. Nostrils small, the anterior without tube. Eyes large, without orbital fold. Gillopenings rather wide, close together. [After GÜNTHER].

Distribution of the single species known: Celebes and Tahiti.

1. Poeciloconger fasciatus Gthr.

Poeciloconger fasciatus Günther, Proc. Zool. Soc. London, 1871, p. 673. — Fische d. Südsee, Heft IX. 1910, p. 393.

Tail longer than the body, which is compressed; the length of the head is contained once and two thirds or one and three fourths in that of the trunk. Head narrow, snout pointed, one half longer than the eye. Anterior nostrils rather distant from point of snout. Lips thin; angle of mouth below the middle of the eye. Teeth in narrow bands, the vomerine band only half as long as the maxillary ones. The dorsal rays are not quite so high as the body, but much higher than the anal

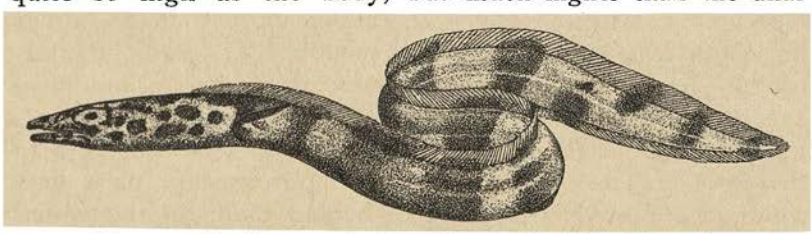

Fig. 115. *Poeciloconger fasciatus* Gthr. × ½. (After GÜNTHER).

rays; the length of the pectorals two sevenths of that of the head. Gillopenings as wide as the orbit, rather close together, not extending upwards above the pectorals. Purplish brown; head with large, round brown spots; trunk with five to six, tail with 6 to 8 brown cross bands, broader than the interspaces and the middle ones the broadest; they extend on the dorsal fin. Dorsal fin with longitudinal lines, anal with a darker margin. In the specimen of Tahiti, some of the crossbands of the tail are broken up into irregular great patches. Length 500 mm. [After GÜNTHER; not seen by us].

Habitat: Only two specimens known: one from Celebes (Menado), the other from Tahiti.

3. Fam. NEENCHELIDAE.

Body scaleless, elongate, anteriorly subcylindrical, posteriorly somewhat compressed. Anus far behind gillopenings, in anterior half of length. Lateral line present. Origin of dorsal at some distance behind gillopenings. Dorsal, anal and caudal confluent. Pectorals present. Snout conical, somewhat prominent by the prominence of the ethmoid together with the intermaxillary plate beyond the articulation with the maxillaries. Cleft of mouth reaching beyond eye. Eye small. Posterior nostrils a long narrow slit in front of eye, anterior nostrils in a short tube near tip of snout, immediately above border of upper lip. Tongue not free. Teeth acute, few, spaced, uniserial in jaws and on vomer. Gillopenings small or medium, lateral, separated by a broad interspace. Branchial openings in pharynx are narrow slits.

Distribution: that of the single genus known.

1. **Neenchelys** Bamber.

(RUTH C. BAMBER, Journ. Linn. Soc. London, Zoology, XXXI. 1915, p. 479).

For characters of the genus see those of the family.

Distribution: Two species known, one from the western

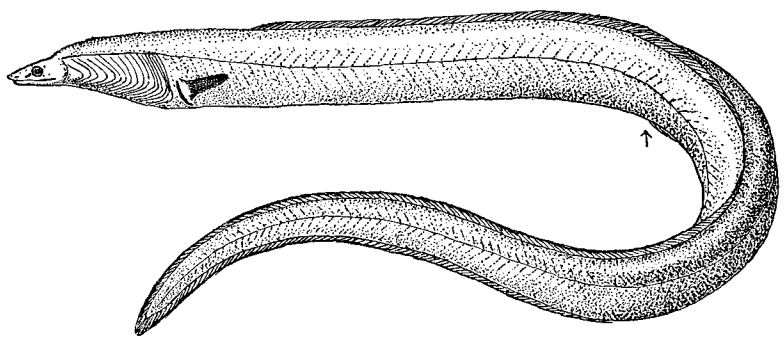

Fig. 116. *Neenchelys buitendijki* n. sp. nat. size.

coast of the Red Sea, and one from the Indo-australian Archipelago.

1. **Neenchelys buitendijki** n. sp.

Subcylindrical, posteriorly compressed. Height 19—21; 2.4—2.6 in length of head. Head 8, about 2 in trunk. Head and body 1.5—1.6 in tail. Eye nearly 18; about 3 times in snout, which goes 5.3—6.7 times in length of head. Cleft of mouth 4.5 times in length of head, extending behind eye for a distance about equal to

diameter of eye. Dorsal and anal low; distance of origin of dorsal from gillopenings about half the distance of gillopenings from corner of mouth. Pectorals 4—4.5 times in length of head, with 11—12 rays. Teeth acute, rather long, uniserial, on jaws and vomer few in number, widely set; on vomer about three, on intermaxillary plate four (or more?) depressible teeth, somewhat

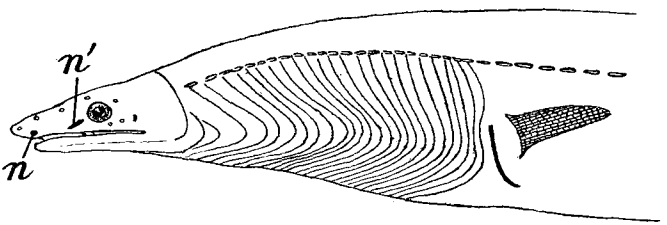

Fig. 117. *Neenchelys buitendijki* n. sp. × 2½. *n* anterior, *n'* posterior nostril. The *radii branchiostegi* are shining through the skin.

longer than the others. Gillopenings vertical, somewhat crescentic, slightly shorter than snout; about 25 branchiostegal rays shining through the skin (see figure). Coloration uniform yellowish gray with a silvery hue. Length 218 mm. [Type of the species in the zoological Museum of Amsterdam].

Habitat: Java (Bay of Batavia), a specimen of 129 mm. collected by Mr. P. BUITENDIJK. We found an other specimen of 218 mm. in an old collection made by Mr. V. D. HUGT, formerly secretary of the Government of Ambon and presented by him to the Royal Zoological Society of Amsterdam. The specimen is therefore most probably from the Moluccos.

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4. Fam. NETTASTOMIDAE.

Body scaleless, elongate, more or less compressed. Tail ending in a slender tip or filament. Anus far behind gillopenings, in anterior half of length. Lateral line present. Dorsal, anal and caudal confluent. Pectorals absent. Snout elongate, pointed, the upper jaw the longer. Nostrils superior or lateral, the posterior slit-like, above or just in front of eye, the anterior tubular or not, not far behind tip of snout. Tongue not free. Cardiform bands of recurved teeth in jaws and on vomer; the lastnamed not separated from those on the intermaxillary plate. Gillopenings small or of moderate size, subinferior and separate. Branchial openings in pharynx are wide slits.

Distribution: Bathypelagic (90—2200 M.). Tropical and warm seas; in northern hemisphere northerly to North Carolina and Japan.

1. Venefica Jordan & Davis.

(Jordan & Davis, Rep. U. S. fish Comm. (1888) 1891, p. 651).

Very elongate, compressed. Anus far behind gillopenings in the anterior half of the body. Origin of dorsal above or somewhat before the gillopenings. Dorsal, anal and caudal confluent. Pectorals wanting. Head moderate, conical, somewhat depressed. Snout prolonged into a slender fleshy flap. Eyes covered by

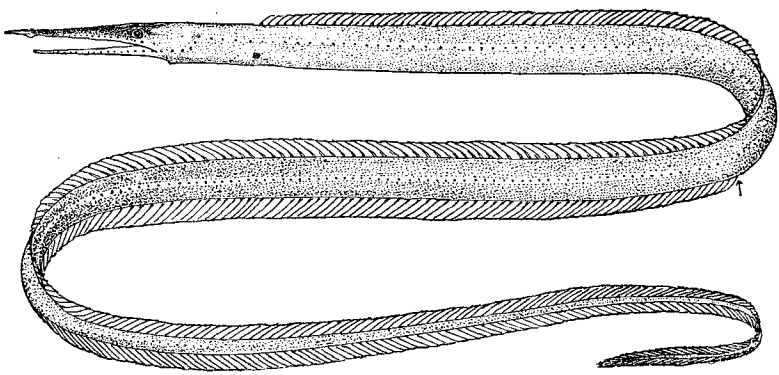

Fig. 118. *Venefica procera* (Goode & Bean).
(After Goode & Bean). Origin of dorsal above the gillopenings. × 1/2.

skin, without free orbital margin. Posterior nostrils wide openings at the upper part of the frontborder of the eye, anterior nostrils in tubes at the top of the snout, behind the base of the flap. No lips. Tongue not free. Bands of cardiform teeth

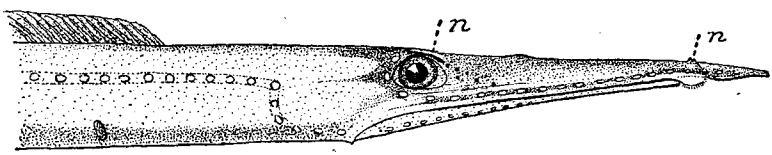

Fig. 119. *Venefica procera* (Goode & Bean). *n n* nostrils. × 3/4. Specimen of the indo-australian archipelago, with the origin of the dorsal before gillopenings.

in jaws and vomer. Lateral line well developed with numerous pores in a single row. Pores in the course of the sensory canals of the head well developed. Gillopenings small, subinferior, separated by a rather broad interspace.

Distribution: Bathypelagic (325—2200 M.). Tropical and warm seas.

1. **Venefica procera** (Goode & Bean.).

Nettastoma procerum Goode & Bean, Bull. Mus. Comp. Zool. X. 1883, p. 224.
Venefica procera Jordan & Davis, Rep. U. S. fish Comm. (1888) 1891, p. 651.
Venefica procera Goode & Bean, Oceanic Ichth. 1895, p. 149.
Venefica procera Jordan & Evermann, Fish. North America I. 1896, p. 365.
Venefica procera Max Weber, Siboga-Exped. Fische, 1913, p. 45.

Head about 3.6 in length of head and trunk, tail twice as long as rest of body. Eye situated about in the middle of the head, nearly $5^1/_2$ times in snout, without the fleshy flap, which is longer than the eye. Snout projecting beyond lower jaw by the intermaxillary plate, which is strongly denticulated. Points of teeth directed backward, somewhat stronger on vomer and partly on lower jaw. Cleft of mouth reaching one eye-diameter behind eye. Origin of dorsal before gillopenings (Siboga-specimens), according to GOODE & BEAN above gillopening. Length 750 mm.

Habitat: Celebes Sea (fine gray mud 1301 M.)!. — East Coast of North America (33° to 34° N. 76° W. 325—1993 M.); off San Pedro, California.

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5. Fam. HETEROCONGRIDAE.

Exceedingly elongate, subcylindrical, scaleless. Anus far behind gillopenings. Tail compressed and nearly twice or more

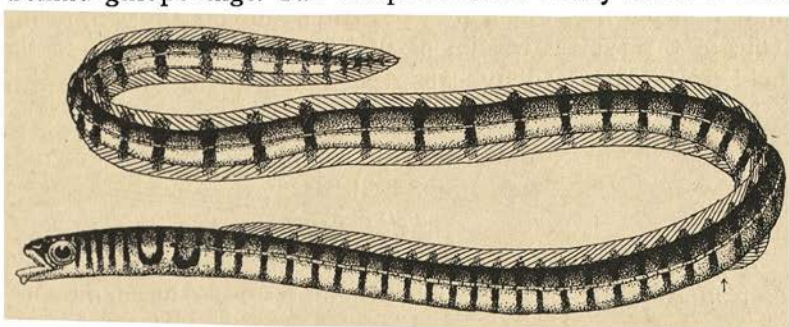

Fig. 120. *Heteroconger polyzona* Blkr. (After BLEEKER).

than twice in head and trunk. Lateral line present. Dorsal, anal and caudal confluent. Pectorals absent. Snout obtuse, very short, cleft of the small mouth obliquely ascending upwards,

extending to below the frontmargin of the eye; the lower jaw projecting beyond the upper. Posterior nostrils a slit near eye; anterior nostrils very small, concealed [1]). Tongue free. Teeth in the jaws and on vomer small, acicular, in narrow bands [2]); and not separated from those of the intermaxillary plate. Gill-openings lateral narrow slits.

Distribution: that of the single genus known.

1. Heteroconger Bleeker.

(BLEEKER, Versl. Med. Akad. Amsterdam (2) II. 1868, p. 331).

For characters of the single genus see those of the family.

Distribution: Ambon. — Canary Islands.

1. Heteroconger polyzona Blkr.

Heteroconger polyzona Bleeker, Versl. Med. Akademie Amsterdam, (2) II. 1868, p. 332.

Heteroconger polyzona Günther, Cat. Brit. Mus. VIII. 1870, p. 44.

Height about 48. Head about 17. Eye 5, conspicuously longer than snout. Height of dorsal less than half height of body, the distance between its origin and the gillopenings is about equal to the length of the cleft of the mouth. Teeth in the upper jaw small, acute, conical, subequal, numerous, in three or four rows. Vomerine teeth acicular, pluriseriate, in an elongate band, which is anteriorly much broader than posteriorly. Bluish-green above, margaritaceous below, with about 80 black transverse bands, 12 of which on the head, not reaching the throat, those on body and tail encircling the body and continued on the fins, which are yellowish hyaline. Length 275 mm. [One of the typical specimens of BLEEKER's collection in the Leiden Museum seen by us].

Habitat: Ambon, in sea.

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6. Fam. MYRIDAE.

(*Echelidae*).

Body scaleless, elongate, vermiform, or slightly compressed, or (*Chilorhinus*) short and much compressed. Anus far behind

1) The specimen of BLEEKER in the Leiden Museum is in a bad state and its snout damaged, where from its anterior nostrils are not visible.

2) BLEEKER calls the vomerine teeth of *H. polyzona* Blkr. "granular". In the specimen of BLEEKER in the Leiden Museum this is certainly not the case; they are acicular as also GÜNTHER calls them in his diagnosis of the genus.

gillopenings, in anterior half of length. Origin of dorsal above or far behind gillopenings, before, above or behind anus. Dorsal, caudal and anal confluent. Pectorals well developed, vestigial or absent. Snout rather short, more or less prominent by the prominence of the ethmoid with the intermaxillary plate beyond the articulation with the maxillaries. Cleft of mouth reaching beyond eye. Eye small or large. Posterior nostrils generally near eye in the upper lip in a valve or protruding flap; anterior nostrils in a short tube at the margin of the upper lip. Tongue not free. Teeth in jaws in one or more series or in bands, differing in form and size; on vomer present or absent, on the intermaxillary in a group or in rows, generally larger or even caniniform. Gillopenings small or very small, separated by an interspace of different breadth. Branchial openings in pharynx are wide slits.

Distribution: Eels usually of small size and plain colours, inhabiting coral reefs, sandy coasts or the surface near them in tropical seas.

Key to the indo-australian genera of Myridae.

1. Pectorals present . . . . . *Paramyrus* p. 273.
2. Pectorals absent . . . . . *Muraenichthys* p. 274.

1. Paramyrus Günther.

(GÜNTHER, Cat. Brit. Mus. VIII. 1870, p. 51).

Very elongate, cylindrical, posteriorly compressed. Anus near beginning of second third of length. Origin of dorsal above pectorals. Dorsal, caudal and anal confluent. Pectorals present. Snout projecting beyond the lower jaw, cleft of mouth reaching hindborder of eye or somewhat behind it. Nostrils on the margin of the upper lip: the posterior one slightly before the vertical through the eye in a pendulous valve, the anterior one near apex of snout in a broad tube. Teeth on vomer and jaws, those on jaws mostly biserial. No scales, lateral line present. Gillopenings small, separated by a broad isthmus.

Distribution: Celebes and Brazil, in sea.

1. Paramyrus microchir (Blkr.).

Echelus microchir Bleeker, Ned. Tijdschr. Dierk. II. (1864) 1865, p. 40. — Atl. Ichth. IV. 1864, p. 30.

Paramyrus microchir Günther, Cat. Brit. Mus. VIII. 1870, p. 51.

D. ca. 310 + C. ca. 10 + A. ca. 214; P. 9.

Height about 40; head 9.3 times in length. Eye 12; snout

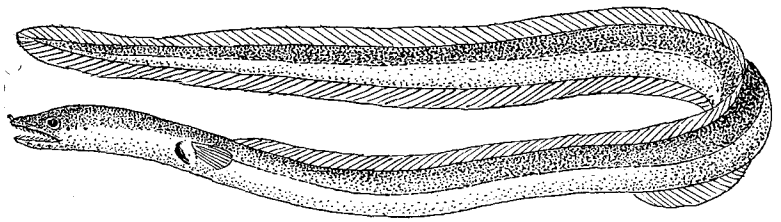

Fig. 121. *Paramyrus microchir* (Blkr.). (After BLEEKER) nat. size.

4.8 times in length of head. Dorsal commencing above the extremity of the pectorals. Pectorals about 4.8 times in head. Teeth conical, small, on the vomer and the sides of the jaws uniserial; anteriorly in the jaws larger and biserial, on the intermaxillary plate also larger and triserial. Grayish above, lighter below, hinder part of anal fin with a black margin. Length of the single specimen known 224 mm. [Type of the species in the British Museum, seen by us].

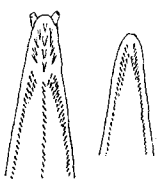

Fig. 122. Dentition of *Paramyrus microchir* (Blkr.). (After BLEEKER).

Habitat: Celebes (Makassar!).

2. **Muraenichthys** Bleeker.

(BLEEKER, Verh. Batav. Gen. XXV. 1853, Muraenoiden p. 71).

Very elongate, cylindrical, even vermiform. Anus before middle of length. Origin of dorsal far behind gillopenings; before, above or slightly behind anus. Dorsal, caudal and anal confluent, generally low. Pectorals absent. Snout somewhat projecting beyond the lower jaw; cleft of mouth extending more or less behind eye. Nostrils on the margin of the upper lip; the anterior in a tube, the posterior at the base of a pendulous flap. Teeth on vomer and jaws. No scales, lateral line present. Gillopenings very small, lateral, separated by a broad isthmus.

Distribution: Indo-australian Archipelago; from Red Sea to Westpacific Islands and Japan. In sea: on reefs, on sandy bottom and pelagic, near shore.

Key to the indo-australian species of Muraenichthys.

I. Dorsal much in advance of the vent.
  1. Origin of dorsal nearer to gillopenings than to vent . . . . . *M. macropterus* p. 275.
  2. Origin of dorsal nearer to vent than to gill-openings . . . . . *M. gymnopterus* p. 276.

II. Origin of dorsal above or slightly behind or before vent.
  1. Head and body twice in tail . . . . . *M. sibogae* p. 276.
  2. Head and body $1^1/_2$ times or less in tail.
    A. Head more than 10 times in length; cleft of mouth extending slightly behind eye . . *M. gymnotus* p. 277.
    B. Head 7 to more than 9 times in length; cleft of mouth reaching far behind eye.
      a. Height 20—30, head 7—8 in length.
        α. Eye situated behind middle of cleft of mouth. Teeth in jaws in bands . . . . *M. schultzei* p. 277.
        β. Eye situated before middle of cleft of mouth. Teeth in the jaws in a single series . . . . . *M. macrostomus* p. 278.
      b. Height 38, head 8 times in length, head and body 1.2 in tail. Snout very pointed. Eye behind middle of cleft of mouth, cleft 4 times in head. . . . . *M. huysmani* p. 278.
      c. Height 40—48, head somewhat more than 9, head and body 1.6 in tail. Snout very pointed. Eye slightly before middle of cleft of mouth, cleft somewhat less than 3 times in head. . . . . *M. acutirostris* p. 279.

1. Muraenichthys macropterus Blkr.

Muraenichthys macropterus Bleeker, Act. Soc. Sc. Indo-neerl. II. 1857, Achtste Bijdr. Vischfauna Ambon, p. 91. — Atl. Ichth. IV. 1864, p. 31.
Muraenichthys macropterus Günther, Cat. Brit. Mus. VIII. 1870, p. 52. — Fische d. Südsee Heft IX. 1910, p. 396.

Height 27.5—40; head about 7.5, 2 to 2.2 in trunk. Head and trunk about 1.3 to 1.5 times in tail. Eye 8—12, twice in snout. Cleft of mouth reaching behind eye. Origin of dorsal nearer to the gillopenings than to anus; its distance from vertical through anus nearly 1.2—1.5 longer than head. Mandibulary and maxillary teeth small, subconical, in 2 series.

Those on the vomer larger and more granular, in two close set series, on the intermaxillary plate in a semicircular row of similar teeth. Colour of alcohol specimens brownish. Length 247 mm.

Habitat: Singapore; Ternate; Ambon; Banda!; Flores!; Solor; Samau!. — Philippines; New Caledonia; Marshall Islands; Tongatabu; Australia [1]).

2. **Muraenichthys gymnopterus** (Blkr.).

Muraena gymnopterus Bleeker, Verh. Batav. Gen. XXV. 1853, Muraenoiden p. 52.
Muraenichthys gymnopterus Bleeker, Ibid. p. 71. — Atl. Ichth. IV. 1864, p. 32.
Muraenichthys microstomus Bleeker, Ned. Tijdschr. Dierk. II. 1864—65, p. 39 — Atl. Ichth. IV. 1864, p. 32.
Muraenichthys gymnopterus Günther, Cat. Brit. Mus. VIII. 1870, p. 52.
Muraenichthys gymnopterus Rutter, Proc. Acad. Nat. Sc. Philadelphia 1897, p. 61.

Height more or less than 30; head $7^1/_2$ to $8^1/_2$; head and trunk about $1^1/_2$ times in tail. Eye about 12—15, about twice in snout. Cleft of mouth reaching more than 3 eyediameters behind eye. Origin of dorsal nearer to anus than to gillopenings, its distance from vertical through anus somewhat less than length of head. Teeth conical, more or less obtuse, the mandibulary ones anteriorly in about 3, posteriorly in 1 to 2 series, the maxillary ones in a narrow band; the other teeth larger, those on the intermaxillary plate in a small group, the vomerine teeth anteriorly in 2—3 rows, posteriorly in 1—2 rows. Colour in alcohol specimens brownish. Length 266 mm.

Habitat: Java (Batavia); Celebes (Makassar!); Batu Islands. — Philippines; China; Kandavu.

3. **Muraenichthys sibogae** n.sp.

Muraenichthys gymnotus Max Weber, Siboga-Expeditie, Fische 1913, p. 46 (nec Blkr.).

Height more or less than 30, head 10—12, head and body twice in length of tail. Eye about 10—12, twice in snout, situated behind middle of cleft of mouth, which reaches slightly behind eye. Origin of dorsal slightly before that of anal; dorsal much lower than anal. Teeth small, acicular, in the jaws in narrow bands, in the vomer in 2 series, anteriorly conspicu-

1) McCulloch (Zool. Results "Endeavour" I. 1911, p. 21) supposes, that the fish cited by Klunzinger as *M. macropterus* Blkr. from Australia belongs to *Muraenichthys breviceps* Günther.

ously longer. Colour of alcohol specimens yellowish brown. Length 135 mm. [Type of the species in the Zoological Museum of Amsterdam].

Habitat: Obi major!; South coast of Timor!. (On reefs and pelagic).

A female specimen of 103 mm. length was already ripe.

4. Muraenichthys gymnotus Blkr.

Muraenichthys gymnotus Bleeker, Act. Soc. Sc. Indo-neerl. II. 1857, Achtste Bijdr. vischfauna Ambon, p. 90. — Atl. Ichth. IV. 1864, p. 33.
Muraenichthys gymnotus Günther, Cat. Brit. Mus. VIII. 1870, p. 53.
Muraenichthys gymnotus Klunzinger, Verh. zool. bot. Ges. Wien XXI. 1871, p. 608.

Height 32—44; head 10.5—11. Head and trunk somewhat less than tail. Eye 12—13, more than twice in snout. Cleft of mouth extending slightly behind eye. Dorsal very low, beginning above or even somewhat behind anus. Teeth conical, those of the jaws posteriorly uni-, anteriorly pluriserial. Vomerine teeth uniserial, about ten; on the intermaxillary plate 6—7 somewhat larger ones forming a circle or semi-circle. Colour yellowish gray. Length 170 mm. [After BLEEKER and KLUNZINGER, not seen by us].

Habitat: Ambon. — Red Sea [1]).

5. Muraenichthys schultzei Blkr.

Muraenichthys Schultzei Bleeker, Nat. Tijdschr. Ned. Indië XIII. 1857, p. 366. — Atl. Ichth. IV. 1864, p. 33.
Muraenichthys schultzii Günther, Cat. Brit. Mus. VIII. 1870, p. 52.
Muraenichthys Schultzei Day, Fish. India 4°. 1878—1888, p. 663.
Muraenichthys Schultzei Max Weber, Siboga-Expeditie, Fische 1913, p. 45.

Height 20—26; head somewhat more than 7; head and trunk

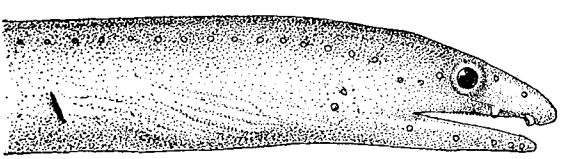

Fig. 123. *Muraenichthys schultzei* Blkr. × 4.

1 1/2 times in length of tail. Eye about 12, one and a half times in snout; situated behind middle of cleft of mouth, which

1) MCCULLOCH (Zool. Results "Endeavour" I. 1911, p. 21) says: "It is very probable that the specimen from Port Jackson which GÜNTHER (CHALLENGER Report 1880, p. 30) doubtfully identified as *M. gymnotus* Blkr., is not that species but is *M. australis*".

reaches one eyediameter behind eye. Origin of dorsal somewhat behind that of anal. Teeth small, acicular, of equal size on jaws and vomer, where they form rather broad, equally long bands; those on intermaxillary plate somewhat larger, in a circular group. Colour of alcohol specimens yellowish brown. Length 130 mm.

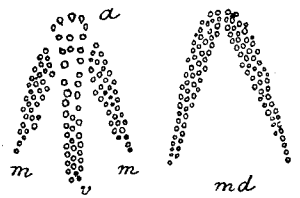

Fig. 124. Dentition of *Muraenichthys schultzei* Blkr. *a* teeth of intermaxillary plate, *m* maxillary, *md* mandibulary, *v* vomerine teeth.

Habitat: Java (Karangbollong); Ambon!; South coast of Timor! (pelagic). — Funafuti; Andaman Islands, Red Sea.

On coralreefs and near shore.

6. Muraenichthys macrostomus Blkr.

Muraenichthys macrostomus Bleeker, Ned. Tijdschr. Dierk. II. 1864—65, p. 38. — Atl. Ichth. IV. 1864, p. 33.
Muraenichthys macrostomus Günther, Cat. Brit. Mus. VIII. 1870, p. 53.
Muraenichthys macrostomus Max Weber, Siboga-Expeditie, Fische 1913, p. 46.

Height 27—30; head about 8; head and trunk less than $1^1/_2$ times in length of tail. Eye small, less than twice in snout, situated before middle of cleft of mouth. Origin of dorsal opposite to that of anal [1]). Teeth conical, recurved, in the jaws in a single series, on the intermaxillary plate forming a group, on the vomer rather few in number, in 2 series. Colour of alcohol specimens yellowish brown. Length 225 mm.

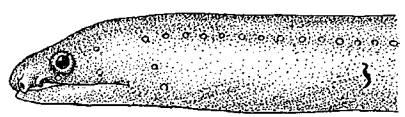

Fig. 125. *Muraenichthys macrostomus* Blkr. × 4.

Habitat: Ambon! (on sandy bottom); Bay of Noimini, South coast of Timor! (pelagic).

7. Muraenichthys huysmani (M. Web.).

Sphagebranchus Huysmani Max Weber, Siboga-Expeditie, Fische 1913, p. 48.

Height 38; head 8, $2^1/_2$ times in trunk; head and trunk nearly $^2/_{10}$ shorter than tail. Eyes about 15, $2/^1_2$ times in snout, which

1) In our specimens the dorsal is less high than the anal but otherwise well developed even at its origin and not rudimentary as in the single specimen described by BLEEKER and GÜNTHER.

is pointed and flattened laterally; they are situated behind middle of cleft of mouth, which is wide and goes 4 times in head. Posterior nostrils somewhat inflated and situated below anterior third of eye; anterior nostrils in a tube opposite to the tip of the lower jaw. Anal low, commencing immediately behind anus; dorsal rudimentary, therefore its origin indistinct

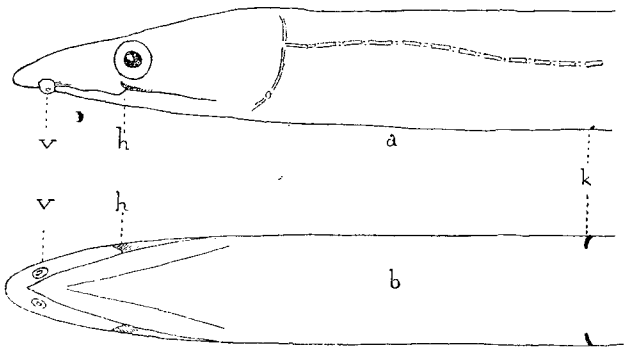

Fig. 126. *Muraenichthys huysmani* (M. Web.).
a lateral, *b* ventral view; *v* anterior, *h* posterior nostril, *k* gillopening.

but probably opposite to anus, dorsal and anal posteriorly produced as a keel. Gillopenings principally situated ventrally, only slightly converging anteriorly. Teeth in the jaws in 2 series. Dark above, light below. Length 115 mm. [Type of the species in the Zoological Museum of Amsterdam].

Habitat: Flores: Strait Molo, sandy bottom, 69—91 M. depth!.

8. **Muraenichthys acutirostris** n.sp.

Height about 40—48; head 9.2; 2.5 in trunk; head and trunk 1.6 in tail. Eye situated in the anterior fifth of the head;

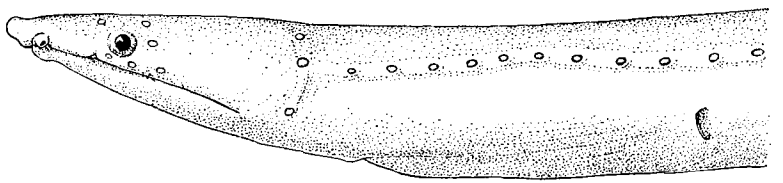

Fig. 127. *Muraenichthys acutirostris* n. sp. × 10.

slightly before the middle of the cleft of the mouth. Snout very pointed and prominent. Cleft of mouth somewhat less than 3 times in length of head, reaching nearly as far behind

eye as length of snout. Origin of dorsal above anus. Teeth conical, in narrow bands on jaws and vomer. Colour of alcohol specimens yellowish white. Length 92 mm. [Type of the species in the zoological Museum of Amsterdam].

Habitat: Ambon, on sandy bottom (2 specimens)!.

This species is allied to *Muraenichthys aoki* Jordan & Snyder, (Proc. U. S. Nat. Mus. XXIII. 1901, p. 863).

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7. Fam. OPHICHTHYIDAE.

Body scaleless, elongate, vermiform or slightly compressed. Anus far behind gillopenings, before or behind middle of length. Caudal wanting. Dorsal and anal fins not confluent, leaving free the tip of the tail, which ends in a more or less sharp point. They are well developed, very low, rudimentary or absent. Pectorals well developed, vistigial or absent. Snout short or long, pointed and projecting beyond lower jaw. Cleft of mouth reaching to below or behind hindborder of eye. Eye small. Posterior nostrils a slit in the border of the upper lip looking downward, only in *Hemerorhinus* and *Ophisurus* above border of upper lip. Anterior nostrils in a tube or papilla on the border of the upper lip or on the ventral surface of the projecting part of the snout. Tongue not free. Teeth pointed, conical or granular, in bands or in uni- or biserial rows, equal or unequal in size. Gillopenings large or small, lateral or ventral, vertical, oblique or longitudinal. Branchial openings in pharynx are wide slits.

Distribution: In temperate and tropical seas, inhabiting shallow water, coral reefs and sandy shores, where many forms have a burrowing habit. Some species enter the fresh water of rivers and brooks.

Artificial key to the indo-australian genera of Ophichthyidae.

I. Posterior nostrils a slit below and behind eye, at some distance above the border of the upper lip. *Hemerorhinus* p. 281.

II. Posterior nostrils in the upper lip, looking downwards.

A. Origin of dorsal before gillopenings.

a. Pectorals short, broad rudiments . . . . . *Myrichthys* p. 283.

b. Pectorals wanting or a filament only . . . . . *Callechelys* p. 286.

B. Origin of dorsal (if present) above or behind gillopenings.

a. Caniniform teeth on vomer and mandibles in a single series. There may be a fringe of barbels on upper lip . . . . . *Brachysomophis* p. 313.

Teeth conical or granular, not caniniform, in jaws in bands or series, on vomer generally present.

a. A conspicuous fringe of barbels on upper lip. *Cirrhimuraena* p. 290.

b. Lips without barbels.

1. No teeth on vomer. . . . . *Leiuranus* p. 293.

2. Teeth on vomer present.

a'. Pectorals well developed.

α. Teeth granular, in bands . . . . . *Pisoodonophis* p. 295.

β. Teeth conical, acute, subequal . . *Ophichthys* p. 300.

b'. Pectorals wanting . . . . . *Sphagebranchus* p. 317.

1. Hemerorhinus n.g.

Much elongate, cylindrical. Anus behind middle of length. Origin of dorsal somewhat behind that of anal. Dorsal and anal not confluent, ending at a short distance from end of tail. Pectorals wanting. Head short, snout pointed, projecting beyond mouth, the cleft of which reaches far behind eye. Lips without

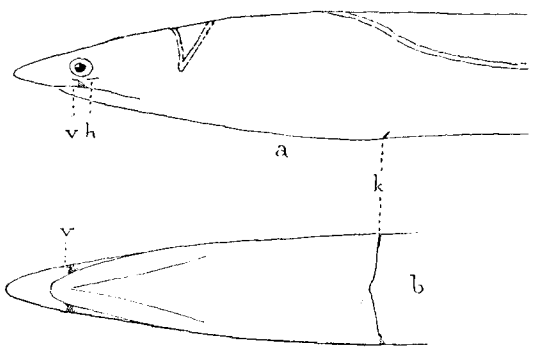

Fig. 128. *Hemerorhinus heyningi* (M. Web.). *a* lateral, *b* ventral view; *v* anterior, *h* posterior nostril, *k* gillopenings, in fig. *b* connected by a furrow.

filaments. Eye small, situated in anterior fourth of head. Anterior nostrils a short tube directed backward at the edge of the upper lip below frontborder of eye; posterior nostrils a long slit, below and behind eye, at some distance above the

border of upper lip [1]). Teeth pointed, recurved, uniserial. Gill-openings small, ventral, vertical, transversally connected by a furrow.

Distribution of the single specimen known: Indo-australian Archipelago.

Note: This genus differs from *Sphagebranchus* by the posterior nostrils, situated above the upper lip, below and behind the eye; it is by this arrangement that this genus is distinguished in the family of the *Ophichthyidae*, as there is only in *Ophisurus serpens* (L.) a comparable arrangement. In this species the anterior nostrils are situated in the middle between eye and tip of snout, at some distance above the upper lip; the posterior nostrils are oblique slits before the vertical through the frontborder of the eye, slightly above the border of the upper lip.

1. **Hemerorhinus heyningi** (M. Web.). [Fig. 128, p. 281].

Sphagebranchus Heyningi Max Weber, Siboga-Expeditie, Fische 1913, p. 46.

Height about 55; head 13; 6 times in trunk; tail 1.3 times in head and trunk. Eye about 13, more than twice in snout, situated above the second third of cleft of mouth. Posterior nostrils a long slit, longer than eye and situated below its hindmost third and behind it; anterior nostrils a short tube directed backward, at the edge of the upper lip, below frontborder of eye. Snout pointed, its conical part projecting beyond the lower jaw by more than one eyediameter. Cleft of mouth thrice in length of head, reaching far behind eye. Origin of dorsal somewhat behind that of anal. Dorsal and especially anal very low. Gillopenings longer than eye, situated ventrally, and transversally connected by a furrow. Head and neighbouring parts of back with light and dark marmorations, otherwise back with dark points continued downward as dark patches between the light round blotches along the lateral line. Length of single specimen known 167 mm. [Type of the species in the Zoological Museum of Amsterdam].

Habitat: Flores: Strait Molo, sandy bottom, 69—91 M. depth!.

1) This is at least our interpretation of the rather long slit. We are not able to make out in the single small specimen at our disposition, that this slit is really in communication with the nasal cavity, but as there is no other posterior nostril, we take this slit for the posterior nostril.

2. **Myrichthys** Girard.

(GIRARD, Proc. Acad. Nat. Sc. Philadelphia 1859, p. 58).

Much elongate. Anus in the anterior half of the length. Dorsal beginning on the nape, far before gillopenings. Dorsal and anal ending at a long or short distance before end of tail. Pectorals short but broad rudiments. Head small, conical. Snout short, pointed, convex, much projecting beyond the mouth, which is small; its cleft extending to the vertical from hind-border of eye or behind it. Eye small. Anterior nostrils in

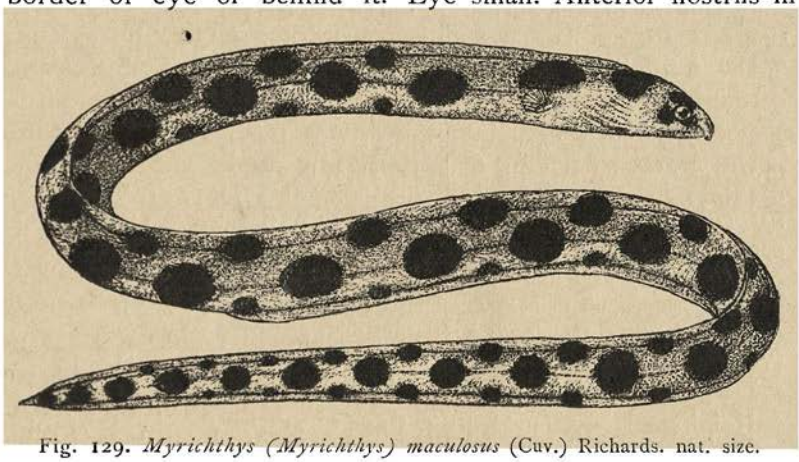

Fig. 129. *Myrichthys (Myrichthys) maculosus* (Cuv.) Richards. nat. size.

tubes on the flattened lower surface of the snout; posterior nostrils wide, in the upper lip, looking downward, anteriorly with a flap. Tongue not free. Teeth obtusely conical or granular, in 2 series in the jaws, on the vomer and intermaxillary plate. Gillopenings rather small, oblique, lateral slits, separated by an interspace of moderate extent.

Distribution: Tropical seas.

Key to the subgenera.

1. Dorsal and anal ending at short distance from tip of tail. *Myrichthys* p. 283.
2. Anal ending before end of dorsal, which is situated far from tip of tail . . . . . *Chlevastes* p. 285.

1. Subgenus **Myrichthys** Girard (s.str.).

(GIRARD, Proc. Acad. Nat. Sc. Philadelphia 1859, p. 58. — Jordan & Davis, U. S. Comm. fish. (1888) 1892, p. 616).

Dorsal and anal ending at a short distance from tip of tail.

Teeth obtusely conical or granular in 2 series in the jaws, on the vomer and intermaxillary plate; on the lastnamed (at least in *M. maculosus*) in a group of 6 teeth.

Distribution: Tropical seas.

1. **Myrichthys (Myrichthys) maculosus** (Cuv.) Richards. [Fig. 129, p. 283].

Ophisurus ophis Lacépède II. 1800, plate 6, Fig. 2 (nec Muraena ophis Bloch) [1]).
Muraena maculosa Cuvier, Règne animal II. 1817, p. 232, note 3.
Muraena tigrina Rüppell, Atl. Reise Afrika, Fische 1826, p. 118 (fide Klunzinger) [1]).
Ophisurus maculosus Richardson, Zoology Voy. Erebus & Terror 1844, p. 102.
Ophisurus maculosus Bleeker, Nat. Tijdschr. Ned. Indië II. 1851, p. 258. — Verh. Batav. Gen. XXV. 1852, Muraenoid. p. 29.
Pisoodonophis maculosus Kaup, Cat. Apodal fish 1856, p. 21.
Pisoodonophis magnifica Abbott, Proc. Acad. N. S. Philad. 1860, p. 476.
Ophisurus ophis Bleeker, Atl. Ichth. IV. 1864, p. 65.
Ophichthys maculosus Günther, Cat. Brit. Mus. VIII. 1870, p. 81.
Ophichthys maculosus Klunzinger, Abh. zoolog. botan. Gesellsch. XXI. 1871, p. 611.
Ophichthys stypurus Smith & Swain, Proc. U. S. Nat. Mus. 1882, p. 120.
Myrichthys magnificus Fowler, Proc. Acad. N.S. Philad. 1900, p. 494. — Jordan & Evermann, Bull. U. S. Fish Comm. XXIII. (1903) 1905, p. 84.
Myrichthys stypurus Jordan & Evermann, Ibid. p. 84.
Ophichthys maculosus Günther, Fische d. Südsee, Heft IX. 1910, p. 401.
Myrichthys magnificus Fowler, Proc. Acad. N. S. Philadelphia 1912, p. 16.

Height 38—47 (according to KLUNZINGER 58—60); head 14.5—17, 5—6 times in trunk; head and trunk three fourths or two thirds of the length of the tail. Eye 8—9, $1^1/_2$—$2^1/_2$ times in snout. Snout short, broad, very convex. Cleft of mouth extending to the vertical from the hindmargin of the orbit, 3 to 4 times in head. Origin of dorsal on the nape, dorsal and anal of moderate height, ending at a short distance from end of tail. Pectorals very short, $6^1/_2$—10 times in head. Teeth in jaws and vomer obtusely conical, in two series; 6 on the intermaxillary plate. White or yellowish white, with 3 series of alternating round, brown spots, the middle series the largest, the upper and lower series partly extending on the fins. Length 1000 mm. [A specimen of BLEEKER's collection in the Leiden Museum seen by us].

Habitat: Java (Patjitan); Buru; Ceram; Banda; German New Guinea!. — From Red Sea and Madagascar to Sandwich Islands.

In sea on reefs.

1) Cfr. Klunzinger, Abhandl. Zoolog. botan. Gesellsch. Wien XXI. 1871, p. 611.

2. Subgenus **Chlevastes** Jordan & Snyder.

(Jordan & Snyder, Proc. U. S. Nat. Mus. XXIII. 1901, p. 867).

Dorsal ending one heads length before tip of tail. Anal

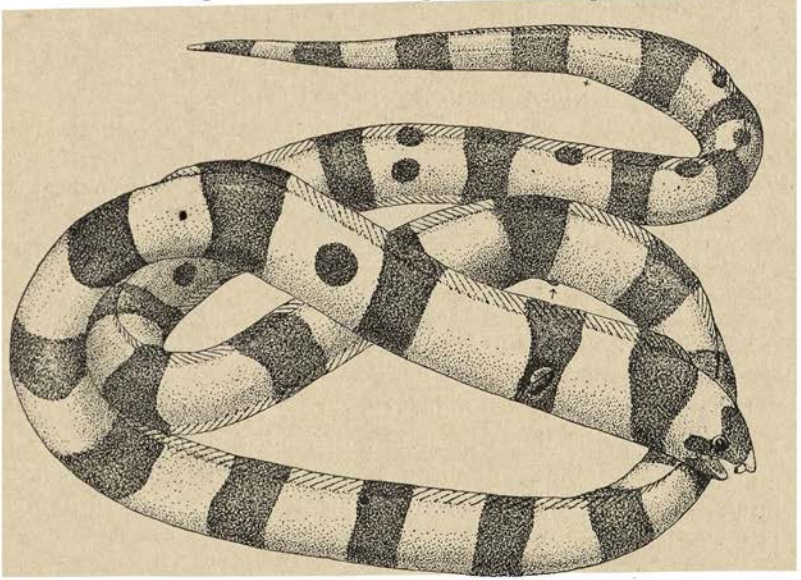

Fig. 130. *Myrichthys (Chlevastes) colubrinus* (Bodd.). × 2/3. + + end of anal and dorsal.

ending two heads length or more before tip of tail. Teeth obtusely conical or granular, in 2 series; those of the intermaxillary plate in a group of about 8 teeth, separated from the others by an interspace and situated in a furrow between the nostrils.

Distribution: From Red Sea, the East coast of Africa, Mauritius through the Indo-australian Archipelago to Japan and the West pacific Islands.

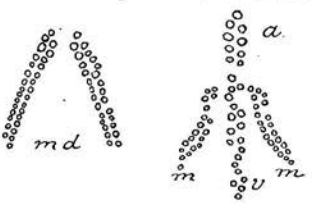

Fig. 131. Dentition of *Myrichthys colubrinus* (Bodd.). *a* teeth on intermaxillary plate, *m* maxillary, *md* mandibulary, *v* vomerine teeth × 2 1/2.

2. **Myrichthys (Chlevastes) colubrinus** (Bodd.).

Muraena colubrina Boddaert in Pallas, Neue Nord. Beiträge II. 1781, p. 56.
Muraena annulata Ahl, De Muraena et Ophichtho 1789, p. 6.
Muraena fasciata Ibid. p. 7.

Ophisurus alternans Quoy & Gaimard, Voy. Uranie I. 1824, p. 243.
Ophisurus fasciatus Richardson, Zoology of the Voy. Erebus & Terror, 1844, p. 100.
Ophisurus colubrinus Richardson, Ibid. p. 100.
Ophisurus colubrinus Bleeker, Nat. Tijdschr. Ned. Indië XI. 1856, p. 106.
Pisoodonophis fasciatus Kaup, Cat. Apodal Fish, 1856, p. 23.
Ophisurus fasciatus Bleeker, Atl. Ichth. IV. 1864, p. 64.
Ophisurus fasciatus Kner, Novara Exp. I. Fische 1865—1867, p. 379.
Ophichthys colubrinus Günther, Cat. Brit. Mus. VIII. 1870, p. 81.
Ophichthys colubrinus Klunzinger, Abhandl. zool. bot. Ges. Wien XXI. 1871, p. 611.
Ophichthys colubrinus Day, Fishes of India 4°. 1878—1888, p. 665.
Ophichthys naja de Vis, Proc. Linn. Soc. N. S. Wales 1884, p. 455.
Chlevastes colubrinus Jordan & Snyder, Proc. U. S. Nat. Mus. XXIII. 1901, p. 867.
Ophichthus colubrinus Seale, Occas. Papers Bernice Tanahi Bishop Mus. I. no. 3, 1901, p. 62.
Chlevastes colubrinus Jordan & Seale, Bull. Bur. Fish. XXV. 1906, p. 195.
Chlevastes fasciatus Jordan & Seale, Ibid. p. 195.
Ophichthys colubrinus Günther, Fische der Südsee, Heft IX. 1910, p. 401.
Chlevastes elaps Fowler, Proc. Acad. Nat. Sc. Philadelphia LXIV. 1912, p. 13.

Height 52—66; head about 18—20, $7^1/_2$—9 times in trunk. Eye 10—14; $2^1/_2$ times in snout. Brownish white, with 26 to more than 30 black or brown rings, about as wide as the interspaces and extending on the fins. Tip of snout and tip of tail whitish. Length over 900 mm.

In the variety *semicincta* Bleeker the rings are ventrally not closed.

In the variety *oculata* Bleeker or *fasciata* Günther the rings are much narrower than the interspaces, which contain a pair of brown ocellated spots, one above the other.

In the variety *elaps* Fowler, the broad interspaces contain 1 to 5 brown spots or blotches.

Distribution: Sumatra (Priaman); Nias!; Borneo; Celebes (Menado); Flores; Savu!; Timor; Buru; Ambon; Nusa Laut!; Banda; Ceram; Gisser!; Batjan; Ternate; Schouten Islands (Mysore); New Guinea (Humboldt Bay!, West-New Guinea!); Cocos (Keeling) Islands. — Red Sea; Zanzibar; Mauritius; Andaman Islands; Philippines; Japan; Riu-Kiu Islands; West Pacific Islands to Tahiti; New Zealand (Auckland).

In sea, on coralreefs and near shore.

3. **Callechelys** Kaup.

(KAUP, Cat. Apodal fish 1856, p. 28).

Much elongate, cylindrical. Anus behind or much behind middle of length. Origin of dorsal above angle of mouth or

somewhat behind it. Dorsal and anal not confluent, ending at a short distance from end of tail. Pectorals wanting or only a filament. Head short; snout convex, more or less depressed and pointed, projecting beyond mouth, the cleft of which reaches below or behind hindborder of eye. Edge of upper lip without or only with few filaments. Eye small, situated in the anterior fifth or sixth of the head. Posterior nostrils a slit

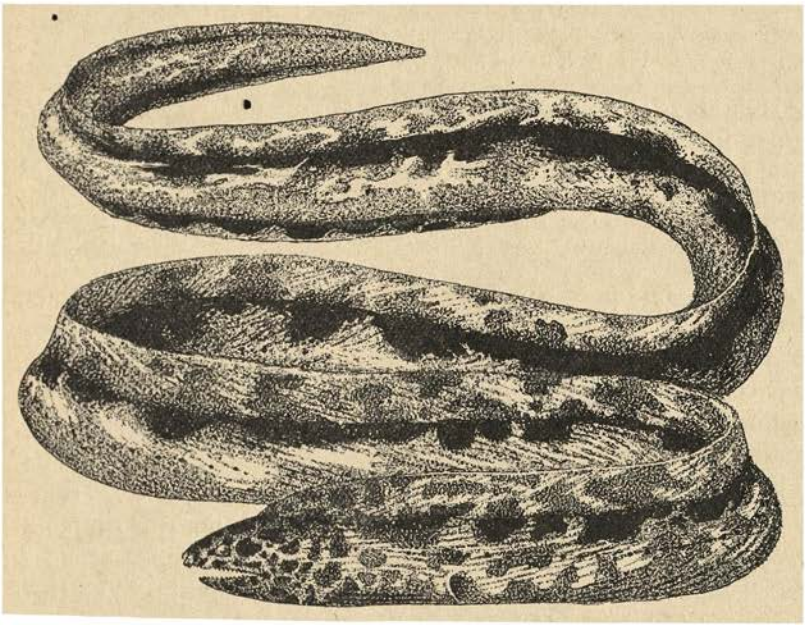

Fig. 132. *Callechelys marmoratus* (Blkr.). (After BLEEKER) ca. × 3/5.

or short tube in the upper lip, below the frontborder of the eye or in advance of it; anterior nostrils a short tube on the edge of the snout. Teeth few in number, acute, recurved, subequal, no canines, uniserial, partly biserial or on all bones biserial. No scales, lateral line present. Gillopenings small, lateral.

Distribution: Tropical waters of Indic and Pacific and Gulf of Mexico.

Key to the indo-australian species of Callechelys.

I. No pectorals.

1. Border of upper lip with 3 filaments. Coloration uniform. . . . . *C. sibogae* p. 288.

2. No filaments on upper lip.
   a. Marbled with brown and yellow; head and body $1^3/_4$ times the length of the tail . . . . . *C. marmoratus* p. 288.
   b. A broad black band along the upper part of the sides; head and body $2^1/_3$—3 times the length of the tail . . . . . *C. melanotaenia* p. 289.

II. Pectorals reduced to a minute filament . . . . . *C. filaria* p. 290.

1. Callechelys sibogae M. Web.

Callechelys Sibogae Max Weber, Siboga-Expeditie, Fische 1913, p. 49.

Height 79; head 18, 10 times in trunk; tail more than $1^1/_2$ times in length of head and trunk. Eye about 20, more than twice in snout. Anterior nostril a tube, separated by a filament from the posterior nostril, which forms a kind of tube, directed backwards, behind which there are two other small filaments. Snout convex, somewhat depressed, prominent. Cleft of mouth reaching one eye-diameter behind eye, equal to five times the length of head. Origin of dorsal shortly behind vertical through angle of mouth. Dorsal and anal low, ending at some distance from tip of tail. Pectorals none. Teeth pointed, in 2 series, about 3 pairs on the intermaxillary plate, which are separated from the other teeth. Colour of alcohol specimen yellowish, branchial region blackish. Length of the single specimen known 237 mm. [Type of the species in the zoological Museum of Amsterdam].

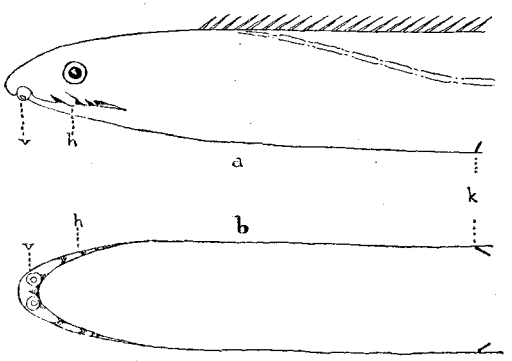

Fig. 133. *Callechelys sibogae* M. Web.
a lateral, *b* ventral view; *v* anterior, *h* posterior nostril, *k* gillopening.

Habitat: South-coast of Timor (Bay of Noimini!), pelagic.

2. Callechelys marmoratus (Blkr.) [Fig. 132 on p. 287].

Dalophis marmorata Bleeker, Verh. Batav. Gen. XXV. 1852, Muraenoid. p. 37. — Nat. Tijdschr. Ned. Indië VII. 1854, p. 100.
Sphagebranchus marmoratus Kaup, Cat. Apodal fish. 1856, p. 26.
Callechelys marmoratus Bleeker, Atl. Ichth. IV. 1864, p. 66.

Ophichthys marmoratus Günther, Cat. Brit. Mus. VIII. 1870, p. 88.
Callechelys luteus Snyder, Bull. U. S. fish Comm. XXII. 1904, p. 517. — Jordan & Evermann, Bull. U. S. fish Comm. XXIII (1903) 1905, p. 86.
Ophichthys marmoratus Günther, Fische d. Südsee Heft IX. 1910, p. 404.

Height 38; head 15 to more than 16, $8^1/_2$—$9^1/_2$ in trunk, head and trunk $1^3/_4$ times the length of the tail. Eye about 16, twice in snout. Snout pointed, convex. Cleft of mouth narrow, reaching behind eye, 3.4—4 times in length of head. Origin of dorsal above angle of mouth, dorsal and anal of moderate height, ending at a short distance from end of tail. Pectorals none. Teeth pointed, recurved, uniserial; biserial on vomer and intermaxillary plate, the latter separated from the other teeth. White with more or less crowded black spots or irregularly marbled with brown and yellow. Length 868 mm. [Type of the species in the British Museum seen by us].

Habitat: Sumatra (Siboga!). — Mauritius!, Pelew!, Molokai, Sandwich Islands.

In sea.

3. Callechelys melanotaenia Blkr.

Callechelys melanotaenia Bleeker, Atl. Ichth. IV. 1864, p. 66.
Ophichthys melanotaenia Günther, Cat. Brit. Mus. VIII. 1870, p. 87.
Ophichthys melanotaenia Klunzinger, Abh. zool. botan. Ges. Wien XXI. 1871, p. 612.
Callechelys melanotaenia Jordan & Snyder, Proc. U. S. Nat. Mus. XXIII. 1901, p. 865.
Ophichthys melanotaenia Günther, Fische d. Südsee, Heft IX. 1910, p. 403.

Height 63—75; head $16^1/_2$—20, 10—$12^3/_4$ in trunk; head and trunk $2^1/_3$—3 times the length of the tail. Eye 12—13; about $1^1/_2$ times in snout. Posterior nostrils below frontborder of eye, anterior nostrils in a tube about equal to eye. Snout pointed, convex. Cleft of mouth extending behind eye, 3—$3^1/_3$ in length of head. Dorsal rather high, commencing above angle of mouth, ending opposite to end of anal, at a distance from tip of tail equal to cleft of mouth. Pectorals none. Teeth few in number, pointed, recurved, uniserial, those on intermaxillary plate stouter and biserial. Colour whitish, with a broad black band along the upper part of the sides; head whitish marbled with dusky. Dorsal with a black margin. Length 530 mm. [After BLEEKER, GÜNTHER, KLUNZINGER, JORDAN & SNYDER and a specimen in the Leiden Museum seen by us].

Habitat: Ambon; Sangir Islands. — Red Sea, Mauritius, Riu Kiu Islands, Lord Howe and Gilbert Islands.

In sea.

4. Callechelys filaria (Gthr.).

Ophichthys filaria Günther, Ann. & Mag. Nat. Hist. X. 1872, p. 425. — Brenchley's Cruise of the "Curaçoa" 1873, p. 428. — Fische d. Südsee, Heft IX. 1910, p. 404.

Extremely elongate, height about 120, $4^1/_2$ times in head; head 21 times in length, one-ninth or one-tenth of trunk, head and trunk somewhat longer than tail. Eye small, more than twice in snout, nearer to angle of mouth than to point of snout. Snout pointed, projecting beyond mouth. Anterior nostrils with a small tube, posterior nostrils on the inner side of the lip below the frontmargin of the eye. Cleft of mouth of moderate width, extending to some distance behind the eye. Dorsal commencing midway between the gillopenings and the eye; dorsal and anal about half as high as the body. Pectorals reduced to a minute filament, about as long as the eye. Teeth acute, uniserial, the hindermost in the maxillaries biserial, on the intermaxillary plate 3 teeth in a triangle, widely separated from the other teeth. Coloration uniform. Length over 600 mm. [Type of the species in the British Museum seen by us].

Habitat: Misol Island!. — Samoa!.

4. Cirrhimuraena Kaup.

(KAUP, Cat. Apodal Fish 1856, p. 27).

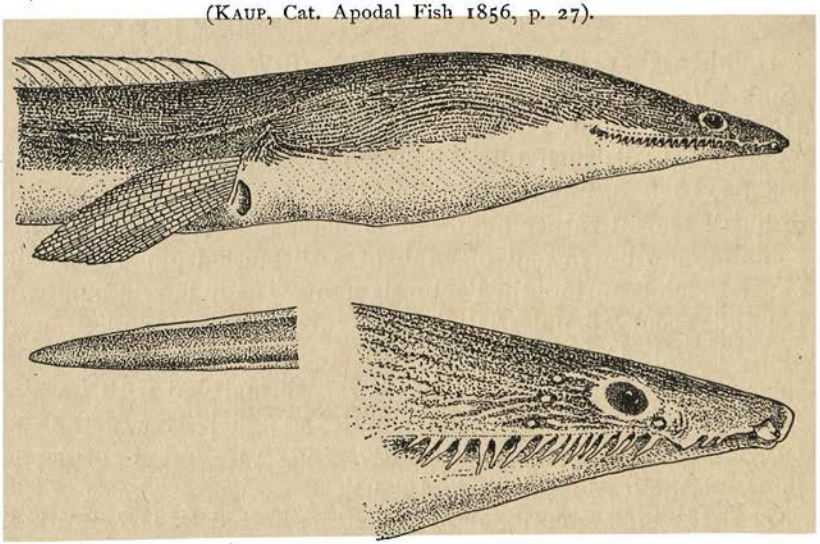

Fig. 134. *Cirrhimuraena chinensis* Kaup. Upper figure and end of tail × 2. Lower figure: anterior part of head to show the labial cirrhi × 4.

Much elongate, cylindrical. Anus in the anterior half of the length. Origin of dorsal above or slightly behind gillopenings. Dorsal and anal not confluent, ending at a short distance from point of tail. Pectorals well developed. Head rather small, pointed. Snout pointed, somewhat projecting beyond the mouth, which is large, its cleft extending far beyond eye. Edge of the upper lip with a fringe of barbels. Eye small. Anterior nostrils short tubes on the edge of the snout; posterior nostrils a slit on the inner side of the upper lip. Tongue not free. Teeth equally small, in bands on jaws and vomer, those of the intermaxillary plate in a group, distant from the other teeth. No scales, lateral line present. Gill-openings rather small, before and somewhat below base of pectorals.

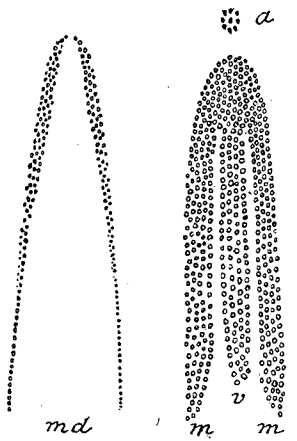

Fig. 135. Dentition of *Cirrhimuraena chinensis* Kaup. *a* teeth on intermaxillary plate, *m* maxillary, *md* mandibulary, *v* vomerine teeth. × 4.

Distribution: Red Sea, Zanzibar, Madagascar, Indo-australian Archipelago, Philippines, China.

Key to the indo-australian species of Cirrhimuraena.

1. Cleft of mouth thrice in length of head. Vomerine band of teeth narrow, consisting of 2 series. . . . . *C. tapeinopterus* p. 291.
2. Cleft of mouth less than thrice in length of head. Vomerine band of teeth broader, consisting of 3 to 4 series.
   a. Origin of dorsal above gillopenings . . . . . *C. chinensis* p. 292.
   b. Origin of dorsal behind base of pectorals. . . . . *C. chilopogon* p. 293.

1. Cirrhimuraena tapeinopterus Blkr.

Cirrhimuraena tapeinopterus Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 183. — Atl. Ichth. IV. 1864, p. 41.
? *Cirrhimuraena tapeinoptera* Kner, Fische Novara-Exp. 1865—1867, p. 376.
Ophichthys tapeinopterus Günther, Cat. Brit. Mus. VIII. 1870, p. 75.
Ophichthus tapeinopterus Jordan & Seale, Bull. Bureau fish. Washington XXVI. (1906) 1907, p. 6.

Height 26—30; head about 10, about $2^1/_3$ in trunk; head and trunk nearly twice in tail. Eye less than 15; more than one and a half times in snout. Cleft of mouth reaching far behind eye, thrice in length of head. Origin of dorsal above or somewhat behind gillopenings. Pectorals twice or somewhat more in length of head. Teeth small, with the points directed backward, of equal size, forming in the maxillaries a broadish band, broadening posteriorly; in the mandibles a narrower band; that of the vomer narrow and of 2 series of teeth; on the intermaxillary plate about six teeth in 2 series, distant from the others. Brown, darker above, lighter below. Length about 300 mm.

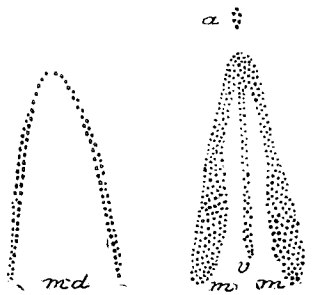

Fig. 136. Dentition of *Cirrhimuraena tapeinopterus*. *a* teeth on intermaxillary plate, *m* maxillary, *md* mandibulary, *v* vomerine teeth. × 3.5.

Habitat: Java, Celebes (Makassar!); Flores!. — Philippines. In sea.

2. Cirrhimuraena chinensis Kaup
[Fig. 134, 135, p. 290, 291].

Cirrhimuraena chinensis Kaup, Cat. Apod. fish 1856, p. 27.
Ophisurus polyodon Bleeker, Act. Soc. Sc. Indo-neerl. VIII. 1860, Achtste Bijdr. Vischfauna Sumatra p. 86.
Cirrhimuraena polyodon Bleeker, Atl. Ichth. IV. 1864, p. 41.
Ophichthys chinensis Günther, Cat. Brit. Mus. VIII. 1870, p. 75.
Cirrhimuraena chinensis Max Weber, Siboga-Expeditie, Fische 1913, p. 50.

Height 32—35; head 8.5 to more than 9, more than twice in trunk. Head and trunk 1.7 to nearly twice in tail. Eye 16—18, somewhat more than twice in snout. Cleft of mouth reaching far behind eye, 2.5 to 2.7 in length of head. Origin of dorsal above gillopenings. Pectorals narrow and long, conspicuously more than twice in length of head. Teeth small, with the points directed backward, of equal size, forming in the maxillaries a broad band; that in the mandibles is narrower and posteriorly reduced, that of vomer broad with about 4 series of teeth; on the intermaxillary plate an irregular group of about 10 teeth, distant from the others. Brown, darker above, lighter below. Length more than 350 mm.

Habitat: Sumatra (Padang, Priaman); Celebes (Makassar!).— Philippines, China; Madagascar.

In sea, on coralreefs and near shore.

3. Cirrhimuraena chilopogon (Blkr.).

Ophisurus cheilopogon Bleeker, Act. Soc. Sc. Indo-neerl. VIII. 1860, 13. Bijdr. Celebes p. 59.
Cirrhimuraena chilopogon Bleeker, Atl. Ichth. IV. 1864, p. 42.
Ophichthys chilopogon Günther, Cat. Brit. Mus. VIII. 1870, p. 76.
Cirrhimuraena cheilopogon Max Weber, Siboga-Expeditie, Fische 1913, p. 51.

Height about 35; head about $9^2/_3$; twice and two thirds in the length of the trunk. Head and trunk is contained once and two-thirds in that of the tail. Eye 16—17; more than twice in snout. Cleft of mouth reaching far behind eye, 2.5 in length of head. Origin of dorsal the length of the snout behind gill-openings; dorsal rather high. Pectorals about $2^1/_2$ in head [1]). Teeth small, acute, forming bands; those of the maxillaries much broader posteriorly than anteriorly; those of the mandibles not much narrower. The band on the vomer broad, not shorter than those of the maxillaries, consisting of 3 to 4 rows of teeth. On the intermaxillary plate a semioval patch of about 20 teeth. Dark above, light below. Length 475 mm.

Habitat: Celebes (Badjoa); South coast of Timor (pelagic)!.

Note. We are not sure that this species, of which only 2 specimens from Badjoa and a small specimen of 80 mm. from the Siboga Expedition, are known, is not identical with *C. chinensis*.

5. Leiuranus Bleeker.

(Bleeker, Verh. Bat. Gen. XXV. 1852, Muraenoiden, p. 36).

(*Stethopterus* Bleeker).

Elongate, cylindrical. Anus in the posterior half of length, less than length of head behind middle of length. Origin of dorsal at a short distance behind gillopenings. Dorsal and anal not confluent, the caudal wanting. Pectorals small. Head small; snout pointed, much projecting beyond the mouth, which is small,

1) In the small specimen of 80 mm. from the Siboga expedition, the only one seen by us, the pectorals goes $4^1/_2$ in head.

its cleft extending beyond eye. Eye small. Anterior nostrils in tubes on the flattened lower surface of the snout; posterior nostrils rather wide, in the upper lip, looking downward, anteriorly with a flap. Tongue not free. Teeth pointed, of moderate size, about ten in one series on each side of the maxillaries and mandibles; none on vomer; four on intermaxillary plate, far distant from the maxillary series, situated in the

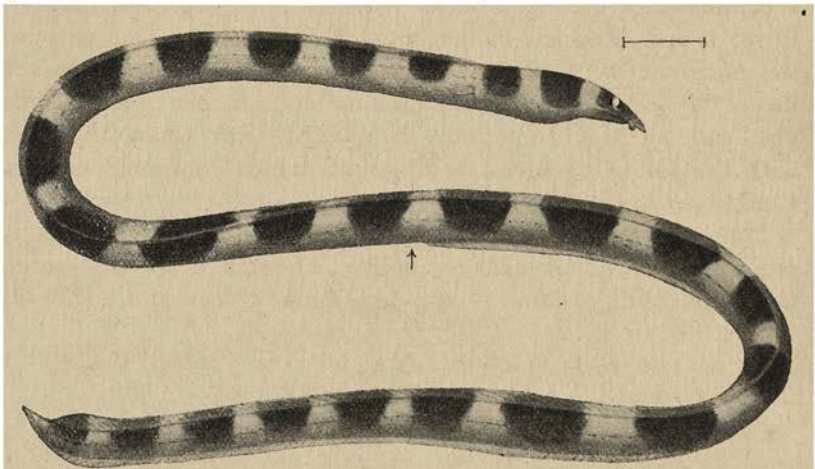

Fig. 137. *Leiuranus semicinctus* (Lay & Benn.).

furrow between the nostrils. No scales, lateral line present. Gillopenings lateral, small, vertical slits, separated by a broad interspace.

Distribution: From Indo-australian Archipelago to Japan and in the Pacific the to Sandwich Islands.

1. **Leiuranus semicinctus** (Lay & Benn.).

Ophisurus semicinctus Lay & Bennett, Fishes in Beechey's Voyage 1839, p. 66.
Ophisurus? *(Sphagebranchus*?*) vimineus* Richardson, Fishes Voy. Sulphur 1843—1845, p. 107.
Stethopterus vimineus Bleeker Verh. Batav. Gen. XXV. 1852, Muraenoiden p. 24.
Leiuranus Lacepedii Bleeker, Verh. Bat. Genootsch. XXV. 1852, Muraenoiden, p. 36.
Leiuranus colubrinus Kaup, Cat. Apod. fish. 1856, p. 2 (Syn. p.p.).
Leiuranus colubrinus Bleeker, Ned. Tijdschr. Dierk. II. 1864—1865, p. 126.
Leiuranus colubrinus Bleeker, Atl. Ichth. IV. 1864, p. 42.
Leiuranus colubrinus Kner, Fische Novara-Exp. 1865—1867, p. 378.
Liuranus semicinctus Günther, Cat. Brit. Mus. VIII. 1870, p. 54.
?*Ophichthys cobra* de Vis, Proc. Linn. Soc. N. S. Wales, 1884, p. 455.

Leiuranus semicinctus Jordan & Snyder, Proc. U. S. Nat. Mus. XXIII. 1901, p. 866.
Leiuranus semicinctus Jordan & Evermann, Bull. U. S. fish. Comm. XXIII (1903) 1905, p. 81.
Liuranus semicinctus Günther, Fische Südsee, Heft IX. 1910, p. 396.

Height 46—55; head 12—15, more than 6 times in trunk; head and trunk one-seventh longer than tail. Eye 10—12; twice in snout. Pectorals about equal to length of snout. Alcohol specimens are cream-coloured with 24 — exceptionally 21 — to 35 broad blackish bands, much wider than the interspaces, but narrower ventrally, where in many specimens they do not meet. Tip of snout and tail cream-coloured; the 2 first bands on head narrow, sometimes connected with each other and with the following broad band. Black bands continued on fins. Length to 500 mm.

Habitat: Java; Sumatra (Siboga); Batu; Flores; Ambon; Nusa Laut!; Saonek near Waigeu!; Schouten Islands (Mysore); Cocos (Keeling) Island. — Japan; China; Queensland; Hawaii; Samoa; Fidji.

In sea, on reefs and near shore.

6. **Pisoodonophis** Kaup (emend. Bleeker).

(KAUP, Cat. Apodal fish 1856, p. 15; BLEEKER, Atl. Ichth. IV. 1864, p. 58).

Much elongate, cylindrical. Anus in or behind the middle of the length. Origin of dorsal above or somewhat behind pectorals. Dorsal and anal not confluent, ending at a short distance from end of tail. Pectorals well developed. Head moderate, pointed. Snout more or less pointed, projecting beyond the mouth, the cleft of which reaches below hindborder of eye or beyond it. Edge of upper lip without a fringe of barbels. Eyes small, situated in the anterior third or fourth of the head. Posterior nostrils a slit on the inner side of the upper lip, below the frontborder of the eye or in advance of it; anterior nostrils a short tube on the edge of the snout. Teeth granular, subequal, in several series forming bands; those on the intermaxillary plate in a group contiguous with or separated from the other teeth. No scales, lateral line present. Gillopenings moderate or small, before and somewhat below base of pectorals.

Distribution: Indo-pacific region from Gulf of Oman and Madagascar to Samoa, Japan and Australia.

Artificial key to the indo-australian species of Pisoodonophis.

A. Origin of dorsal behind end of pectorals.

1. Dorsal and anal very elevated, height of latter equal to that of body; head and trunk nearly twice in length of tail . . . . . *P. hypsclopterus* p. 296.
2. Dorsal and anal very low, head and trunk one and a half times or less in tail.
   a. Head 3.2—3.6 times in trunk . . . . . *P. boro* p. 297.
   b. Head 4 times in trunk . . . . . *P. micropterus* p. 298.

B. Origin of dorsal above middle of pectorals.

1. Head and trunk equal to length of tail . . . . . *P. hoeveni* p. 299.
2. Head and trunk $1^1/_2$ times in tail . . . . . *P. cancrivorus* p. 300.

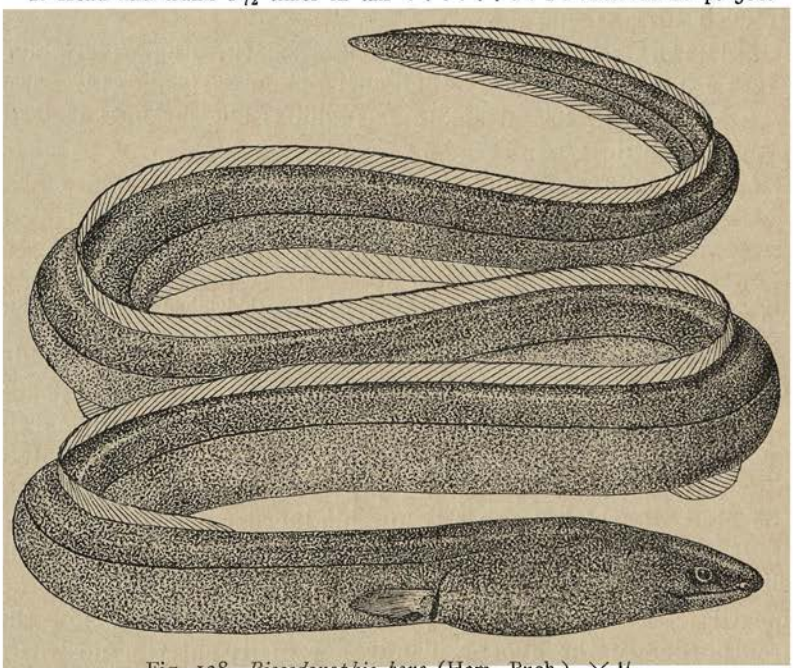

Fig. 138. *Pisoodonophis boro* (Ham. Buch.). × $^1/_2$.

1. Pisoodonophis hypselopterus (Blkr.).

Ophisurus hypsclopterus Bleeker, Nat. Tijdschr. Ned. Indië II. 1851, p. 69. — Verh. Batav. Gen. XXV. 1852, Muraenoid. p. 34.
Pisoodonophis hypselopterus Kaup, Cat. Apod. fish 1856, p. 19.
Pisoodonophis hypselopterus Bleeker, Atl. Ichth. IV. 1864, p. 63.
Ophichthys hypselopterus Günther, Cat. Brit. Mus. VIII. 1870, p. 79. — Fische d. Südsee Heft IX. 1910, p. 400.

Height 49; head about 12, 3.8 times in trunk; head and trunk one and a half times in length of tail. Eye about 15, twice or more in snout. Snout depressed, somewhat pointed. Posterior nostrils slightly before eye, anterior nostrils in a tube nearly equal to length of eye. Cleft of mouth reaching far behind eye, about thrice in length of head. Dorsal commencing about half length of head behind gillopenings. Dorsal and especially the anal elevated, the latter being as deep as the body, ending at a short distance from end of tail. Pectorals 4 times in head. Teeth granular, in several series, forming broadish bands. The vomerine band much longer than the maxillary bands. On the intermaxillary plate an oval group of about 12 teeth, contiguous with the maxillary and the vomerine band of teeth. Greenish, fins yellowish. Length more than 750 mm. [Type of the species in the British Museum seen by us].

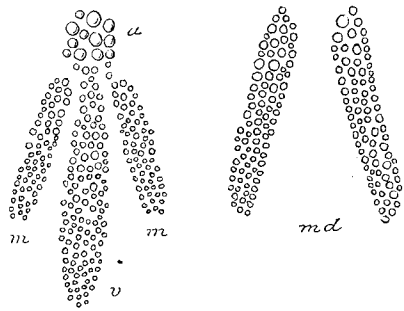

Fig. 139. Dentition of *Pisoodonophis hypselopterus*. *a* teeth on intermaxillary plate, *m* maxillary, *md* mandibulary, *v* vomerine teeth. × 3.

Habitat: Borneo (Banjermassin!); — Ponapé.

Ascending rivers.

2. **Pisoodonophis boro** (Ham. Buch.) [Fig. 138, on p. 296].

Ophisurus boro Hamilton Buchanan, Fish. Ganges 1822, p. 20, 363.
Ophisurus harancha Hamilton Buchanan, Ibid. p. 21, 363.
Ophisurus caudatus Mc Clelland, Calcutta Journ. Nat. Hist. V. 1844, p. 211.
Ophisurus boro Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 1304.
Ophisurus boro Bleeker, Verh. Batav. Gen. XXV. 1853, Bengalen p. 156.
Ophisurus potamophilus Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 458. — Verh. Batav. Gen. XXV. 1852, Muraenoid. p. 68.
Pisoodonophis boro Kaup, Cat. Apod. fish 1856, p. 17.
Pisoodonophis potamophilus Kaup, Ibid. p. 20.
Pisoodonophis boro Bleeker, Atl. Ichth. IV. 1864, p. 62.
Pisoodonophis potamophilus Bleeker, Ibid. p. 63.
Ophichthys boro Günther, Cat. Brit. Mus. VIII. 1870, p. 77.
Ophichthys boro Day, Fish. India 4°. 1878—88, p. 664.
Ophichthys boro Max Weber, Siboga-Expeditie, Fische, 1913, p. 51.

Height 32—36; head 9—12.5, 3.2—3.6 in trunk, head and trunk more or less than $1^1/_2$ times in tail. Eye 12—17 (13.3 in

a specimen of 929 mm.), about twice in snout, which is somewhat depressed, prominent but obtuse, more pointed in young. Posterior nostrils somewhat in advance of eye, anterior nostrils in a short tube. Cleft of mouth about 4 times in length of head, extending far behind eye. Dorsal beginning behind gill-openings at a distance equal to or longer than half length of head; dorsal and especially anal very low, both ending at a very short distance from tip of tail. Pectorals 4 times in length of head. Teeth granular, in several series, forming bands, broader in adult examples; on vomer 3 to 4 series; those on inter-

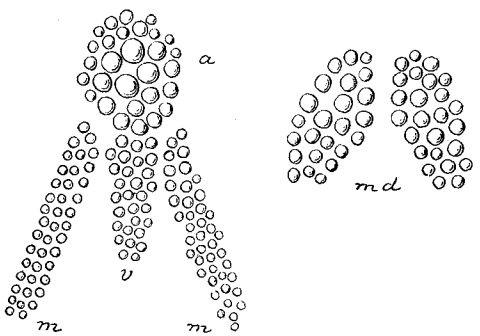

Fig. 140. Dentition of *Pisoodonophis boro* (Ham. Buch.) adult. × 2½.

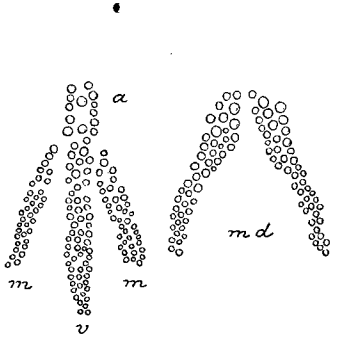

Fig. 141. Dentition of *Pisoodonophis boro* (Ham. Buch.) juv.

a teeth on intermaxillary plate, *m* maxillary, *md* mandibulary, *v* vomerine teeth. × 2½.

maxillary plate stouter, not separated from vomerine teeth, in old examples forming an oval group. Blackish brown above, lighter below. Length 930 mm.

Habitat: Sumatra (Lower Langkat); Singapore; Java (Prigi); Celebes (Makassar!, Menado); Rusa Linguette, north coast of Flores!; Ambon; Halmaheira; Goram; New Guinea (Doreh). — Formosa; Cochin; Macao; Swatow; British India.

In sea, estuaries, brackish and fresh water, ascending rivers.

3. Pisoodonophis micropterus Blkr. [1]).

Pisoodonophis micropterus Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 182. — Ibid. II. 1864/65, p. 129. — Atl. Ichth. IV. 1864, p. 59.

Height about 40; head about 13; 4 times in trunk; head and trunk shorter than tail. Eye 14, about twice in snout. Posterior nostrils below anterior margin of eye, anterior nostrils

1) This species has been overlooked by GÜNTHER in his Catalogue Brit. Mus. VIII, 1870.

in a tube about equal to length of eye. Snout acute, convex; cleft of mouth reaching behind eye, $4^1/_2$ times in length of head. Dorsal commencing behind gillopenings at a distance more than half length of head. Dorsal and anal very low, ending at a short distance from end of tail. Pectorals rounded, 5 times in length of head. Teeth conical and granular, forming bands of 3—4 series, the maxillary band is in the middle, the mandibulary band anteriorly broadest. The teeth on the maxillary plate and on vomer are contiguous; the firstnamed and the anterior mandibulary teeth are the stoutest. Brownish above, lighter below. Length of the single specimen known 545 mm. [Description made after the type of BLEEKER, preserved in the Leiden Museum].

Habitat: Celebes (Makassar!), in sea.

4. **Pisoodonophis hoeveni** (Blkr.).

Ophisurus Hoevenii Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 172. — Verh. Batav. Gen. XXV. 1852, Muraenoid. p. 67.
Pisoodonophis Hoeveni Kaup, Cat. Apod. fish 1856, p. 20.
Pisoodonophis Hoevenii Bleeker, Atl. Ichth. IV. 1864, p. 59.
Ophichthys hoevenii Günther, Cat. Brit. Mus. VIII. 1870, p. 79.

Height about 26; head about $7^1/_2$, $2^2/_3$ times in trunk; head and trunk nearly equal to tail. Eye about 14, two-fifths of the length of the snout. Snout acutely pointed; cleft of mouth reaching behind eye, somewhat less than one-third of the length of the head. Dorsal commencing above the middle of the pectorals. Dorsal and anal well developed, about twice lower than body, ending very near tip of tail. Pectorals about $3^1/_2$ times in head. Teeth granular, forming rather narrow bands of 3 series; the vomerine band the longest. On the intermaxillary plate are about 7 stouter teeth, forming an oval group, nearly reaching the band of vomerine teeth. Greenish above, yellowish below. Length of the single specimen known 316 mm. [Type of the species in the British Museum seen by us].

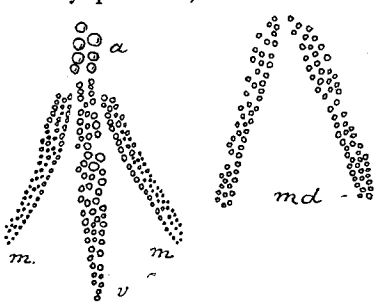

Fig. 142. Dentition of *Pisoodonophis hoeveni* (Blkr.) *a* teeth on intermaxillary plate, *m* maxillary, *md* mandibulary, *v* vomerine teeth. × 3.

Habitat: Celebes (Makassar!), in sea.

5. Pisoodonophis cancrivorus (Rich.).

Ophisurus cancrivorus Richardson, Voy. Erebus & Terror, fishes 1844, p. 97.
Ophisurus sinensis Richardson, Ibid. p. 98.
Ophisurus baccidens Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 1302.
Ophisurus schaapi Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 735. — Verh. Batav. Gen. XXV. 1852, Muraenoid. p. 53.
Ophisurus brachysoma Bleeker, Ibid. p. 776. — Ibid. p. 55.
Pisoodonophis cancrivorus Kaup, Cat. Apodal fish 1856, p. 15.
Pisoodonophis brachysoma Kaup, Ibid. p. 19.
Pisoodonophis Schaapi Kaup, Ibid. p. 19.
Pisoodonophis brachysoma Bleeker, Atl. Ichth. IV. 1864, p. 60.
Pisoodonophis Schaapi Bleeker, Ibid. p. 61.
Pisoodonophis moluccensis Bleeker, Ibid. p. 72.
Pisoodonophis cancrivorus Kner, Novara-Exped., Fische 1865-67. p. 379.
Ophichthys cancrivorus Günther, Cat. Brit. Mus. VIII. 1870, p. 78.
? *Pisoodonophis zophistius* Jordan & Snyder, Proc. U. S. Nat. Mus. XXIII. 1901, p. 868.
Pisoodonophis cancrivorus Jordan & Richardson, Bull. Bureau fisheries Washington XXVII. (1907) 1908, p. 238.
Pisoodonophis cancrivorus Franz, Abh. Akademie München Suppl. IV. 1910, p. 13.
Ophichthys cancrivorus Günther, Fische d. Südsee, Heft IX. 1910, p. 400.

Height 22—33; head $8^1/_2$—10, $2^1/_3$ to more than 3 times in trunk; head and trunk more or less than $1^1/_2$ times in tail. Eye more than 9 to 12; nearly $1^1/_2$ to 2 times in snout. Posterior nostrils nearly below frontborder of eye, anterior nostrils in a short tube. Snout convex, somewhat depressed; cleft of mouth reaching to below hindborder of eye or farther; 3—4 times in length of head. Dorsal commencing above the middle of the pectorals. Dorsal and anal about half height of body, ending at some distance from point of tail. Pectorals 3—4 times in head. Teeth granular, subequal, in rather narrow bands of several series. A group of rather numerous teeth on the intermaxillary plate, more or less separated from the other teeth. Brownish, lighter below, dorsal with a more or less distinct blackish spot anteriorly. Length 760 mm.

Habitat: Singapore; Banka; Celebes (Makassar!); Solor; Ambon. — Pinang; Philippines; China; Japan; Australia; Samoa; Muscat; Mauritius(?); Madagascar.

In sea and estuaries.

7. Ophichthys Ahl.

(Ahl, De Muraena et Ophichtho 1789, p. 3).

Much elongate, cylindrical. Anus somewhat before or much behind middle of length. Origin of dorsal above gillopenings

or slightly behind extremity of pectorals. Dorsal and anal not confluent, ending at a short distance from point of tail. Pectorals well developed. Head moderate, pointed. Snout pointed, generally projecting beyond the mouth, the cleft of which reaches below hindborder of eye or beyond it. Edge of upper lip without a fringe of barbels. Eye small, situated in the anterior third or fourth of the head. Posterior nostrils a slit on the innerside of the upper lip, below the frontborder of the eye

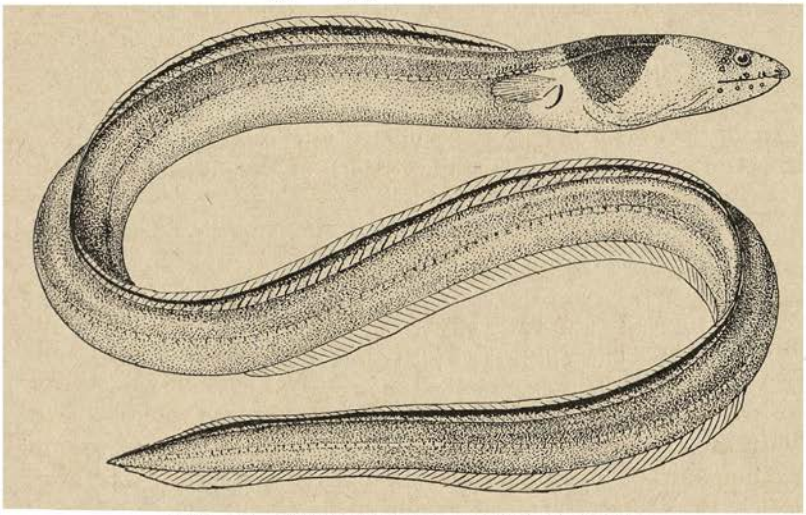

Fig. 143. *Ophichthys cephalozona* (Blkr.). nat. size.

or in advance of it; anterior nostrils a short tube on the edge of the snout. Teeth conical, acute, subequal but no canines, in one or more series in jaws and vomer; those of the intermaxillary plate in a group or in pairs separated from the other teeth. No scales, lateral line present. Gillopenings moderate or small, before and somewhat below base of pectorals.

Distribution: Tropical seas.

Artificial key to the indo-australian species of Ophichthys.

I. Maxillary teeth uniserial.

A. Origin of dorsal behind root of pectorals.

a. Head and trunk somewhat longer or shorter than tail.

1. 18—23 dark brown rings extending on base of dorsal and anal. Pectorals 7 times in head. Jaws nearly equal. *O. bonaparti* p. 303.

2. Nape with a broad black cross band broadly edged with white in front and behind. Pectorals more than twice to four times in head. Snout prominent. *O. cephalozona* p. 303.

3. Coloration uniform. Pectorals more than thrice in head. Snout prominent. . . . *O. bernsteini* p. 304.

b. Head and trunk 1.5—1.6 in tail.

1. Vomerine teeth in a double series. Head about $2^1/_2$ times in trunk. . . . *O. apicalis* p. 305.

2. Vomerine teeth in a triple series anteriorly. Head nearly four times in trunk . . . . . *O. singapurensis* p. 306.

c. Head and body more or less than twice in tail. Vomerine teeth more or less irregularly biserial. Head about four times in trunk . . . . . *O. macrochir* p. 306.

B. Origin of dorsal above gillopenings.

a. Head and trunk longer than tail. Pectorals $5^1/_2$ times in head . . . . . *O. polyophthalmus* p. 307.

b. Head and trunk shorter than tail. Pectorals $2^1/_2$ times in head.

1. Teeth uniserial in jaws and vomer; on intermaxillary plate 5 stouter teeth arranged in a Λ . . . . . *O. melanochir* p. 308.

2. Teeth uniserial in jaws and vomer; only anteriorly in the mandibles they are irregularly triseriate and stouter as also the 6 serially arranged pairs on the intermaxillary plate . . . . . *O. altipinnis* p. 308.

II. Maxillary teeth in a double series, the inner of which may be incomplete.

A. Mandibulary teeth in a double series.

a. Head and trunk about twice in tail.

1. Vomerine teeth in 2 series.

a. Head $5^3/_5$ times in trunk. . . . . *O. rhytidoderma* p. 309.

b. Head 4—$4^1/_2$ times in trunk.

α. Height 46. Teeth in the maxillaries biserial, except the foremost . . . . . *O. rhytidodermatoides* p. 309.

β. Height about 68. Teeth in the maxillaries only biserial in the middle . . . . . *O. lumbricoides* p. 310.

2. Vomerine teeth in 3, on the middle of the bone in 4 series. Head nearly 4 times in trunk. . . . . *O. macclellandi* p. 311

b. Head and body $1^1/_3$ times in tail. Head $2^1/_3$ to $2^3/_4$ times in trunk . . . . . *O. celebicus* p. 311.

B. Mandibulary teeth in a single series as also the vomerine teeth. Head and body slightly shorter than tail . . . . . *O. versicolor* p. 312.

1. Ophichthys bonaparti (Kaup).

Poecilocephalus Bonaparti Kaup, Arch. f. Naturgesch. XXII. 1856, p. 43. — Cat. Apodal fish 1856, p. 5.
Ophisurus chrysospilos Bleeker, Act. Soc. Sc. Indo-neerl. II. 1857, Achtste Bijdr. Vischfauna Ambon p. 8, 27, 88 (name only).
Ophisurus Bonapartei Bleeker, l. c. p. 88.
Poecilocephalus Markworti Kaup, Aale des Hamburger Mus. 1859, p. 10.
Ophichthys Bonapartei Bleeker, Atl. Ichth. IV. 1864, p. 47.
Ophichthys bonapartii Günther, Cat. Brit. Mus. VIII. 1870, p. 69.

Height 33—37; head 12—13, $6^1/_2$—7 times in trunk. Anus in posterior part of third fifth of length. Eye 8—9, rather more than half the length of the snout, situated in the anterior fourth of the length of the head. Cleft of mouth rather wide, two-fifths of the length of the head. Jaws nearly equal. Origin of dorsal above or slightly behind extremity of the pectorals. End of dorsal and anal at a short distance from end of tail. Pectorals small, shorter than snout, about 7 times in length of head. Teeth conical, pointed, curved, subequal, uniserial in all the bones; on the intermaxillary plate in an oval group. Light brownish, with from 18 to 23 dark brown rings, extending on the basal part of the dorsal and anal; anterior half of head brown, with yellowish, black-edged reticulated lines, throat with reniform, brown, dark-edged spots. Margin of dorsal with irregularly placed dark spots. Length 750 mm. [After BLEEKER and GÜNTHER, and a specimen in the Leiden Museum seen by us].

Habitat: Ambon!. — Mauritius.

2. Ophichthys cephalozona (Blkr.) [Fig. 143, p. 301].

Centrurophis spadiceus Kaup, Cat. Apod. fish 1856, p. 2 (p.p. et nec Richardson).
Muraenopsis marginatus Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 179 (nec *Ophichthys marginatus* Peters).
Ophichthys cephalozona Bleeker, Atl. Ichth. IV. 1864, p. 49.
Ophichthys cephalozona Kner, Novara-Exped. Fische 1865—1867, p. 377.

Ophichthys cephalozona Günther, Cat. Brit. Mus. VIII. 1870, p. 69.
Ophichthus cephalozona Jordan & Snyder, Proc. U. S. Nat. Mus. XXIII. 1901, p. 872.
Ophichthys cephalozona Günther, Fische d. Südsee Heft IX. 1910, p. 398.

Height about 28—29; head 10—11, 3.5—4.5 in trunk, head and trunk somewhat shorter than tail (or somewhat longer, GÜNTHER). Eye 10—11, twice in snout, situated in anterior third of head. Snout bluntly pointed, much projecting. Cleft of mouth 3—3.5 in head, reaching behind eye. Posterior nostrils in advance of the eye, anterior ones in a broad tube, shorter than the eye. Origin of dorsal about above end of pectorals. End of dorsal and anal ending shortly before end of tail. Pectorals more than thrice to four times in length of head. Teeth rather large, pointed, curved, uniserial in jaws and vomer, the anterior mandibulary ones stronger, as also those on the intermaxillary plate, which form a separated group of about 4—6 stout teeth. Gillopenings moderate. Brown, nape with a very broad blackish cross band, broadly edged with white in front and behind. Dorsal and anal blackish with a white margin. Length 830 mm.

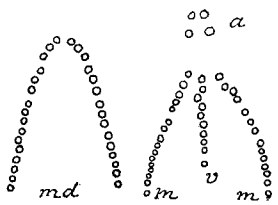

Fig. 144. Dentition of *Ophichthys cephalozona* (Blkr.) *a* teeth on intermaxillary plate, *m* maxillary, *md* mandibulary, *v* vomerine teeth. ×4.

Habitat: Singapore; Ambon; Ceram; Kei Islands!; West New Guinea!; Mysore (Schouten Islands). — Philippines; China; Formosa; Japan; North Australia; Pelew Islands; Ovalau; Tonga-Tabu.

3. **Ophichthys bernsteini** (Blkr.).

Muraenopsis Bernsteini Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 157.
Ophichthys Bernsteini Bleeker, Atl. Ichth. IV. 1864, p. 48.

Height about 42; head about $11^2/_5$, 5 to $5^1/_2$ in trunk; head and body longer than tail. Eye $8^1/_2$, more than one half the length of the snout, situated in the anterior third. Cleft of mouth nearly 4 times in head, ending below hindborder of eye. Snout conspicuously prominent. Posterior nostrils in advance of the eye, anterior ones in a broad tube, shorter than the eye. Dorsal commences at a distance equal to the cleft of mouth, behind the gillopenings. Dorsal and anal increasing in height near their end, which is at a short distance before the end of the tail. Pectorals more than thrice in head. Teeth conical, acute, sub-

equal, slightly curved; uniserial in the jaws, those of the vomer anteriorly biserial; on the intermaxillary plate 4 or 5 subbiserial teeth, far remote from the others. Brownish above, lighter below. Length of the single specimen known 600 mm. [After BLEEKER, not seen by us, as the type is neither in the Leiden nor in the British Museum].

Habitat: Halmahera, in sea.

4. Ophichthys apicalis (Benn).

Ophisurus apicalis Bennett, Cat. Zool. Specim. in Memoir Life of Raffles 1830, p. 692.
Ophisurus spadiceus Richardson, Ichth. China & Japan, British Assoc. (1845) 1846, p. 313. — Zoology Voy. Erebus & Terror 1844—48, p. 103.
Ophisurus compar Richardson, Zoology Voy. Erebus & Terror, 1844—48, p. 105.
Ophisurus bangko Bleeker, Verh. Batav. Gen. XXV 1852, Muraenoid. p. 67.
Centrurophis spadiceus Kaup, Cat. Apod. fish 1856, p. 2.
Centrurophis bangko Kaup, Ibid. p. 3.
Coecilophis compar Kaup, Ibid. p. 6.
Ophisurus Diepenhorsti Bleeker, Act. Soc. Sc. Indo-neerl. VIII. 1860, Achtste Bijdr. Sumatra, p. 85.
Ophichthys banko Bleeker, Atl. Ichth. IV. 1864, p. 51.
Ophichthys diepenhorsti Bleeker, Ibid. p. 52.
Ophichthys apicalis Günther, Cat. Brit. Mus. VIII. 1870, p. 70.
Ophichthys apicalis Bleeker, Ned. Tijdschr. Dierk. IV. (1871) 1872, p. 123.

Height 27—35; head 8.5 to more than 9, about 2.5 times in trunk, head and body about 1,5 to 1.6 times in tail. Eye

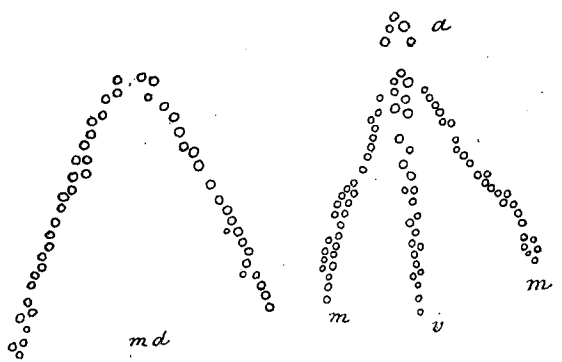

Fig. 145. Dentition of *Ophichthys apicalis* (Benn.). *a* teeth on intermaxillary plate, *m* maxillary, *md* mandibulary, *v* vomerine teeth. × 4.

9—11, nearly twice in snout, which is bluntly acute and prominent. Posterior nostrils in advance of the eye, anterior ones in a broad tube, shorter than eye. Dorsal about twice lower than height of body, commencing somewhat before or behind end

of pectorals. Dorsal and anal ending near point of tail. Pectorals $2^1/_2$ to 3 in length of head. Teeth pointed, conical, in the jaws in a single series, but they may form anteriorly or near the middle an irregular double series. Vomerine teeth stouter and in a double series, the posterior uniserial. On the intermaxillary plate 5 stout teeth form a V, the point directed forward. Uniform brown, lighter beneath, dorsal and anal black or with a black margin. Length 430 mm.

Nomen indig: Banko (Malay. Batavia).

Habitat: Singapore; Sumatra (Priaman, Benkulen); Nias!; Java (Batavia!, Surabaya!); Madura!, Celebes (Makassar). — Philippines, China, Madagascar.

In sea.

5. Ophichthys singapurensis Blkr.

Ophichthys singapurensis Bleeker, Atl. Ichth. IV. 1864, p. 52.
Ophichthys singapurensis Günther, Cat. Brit. Mus. VIII. 1870, p. 71.

Height about 37; head about 13, nearly four times in trunk; head and trunk $^2/_3$ of the length of the tail. Eye about 10, about one half of the length of the snout. Posterior nostrils in advance of the eye, anterior nostrils in a tube, much shorter than eye. Snout very acute and prominent, cleft of mouth about $3^3/_5$ in the length of the head, reaching below hindmargin of eye. Dorsal twice lower than height of body, commencing above the end of the pectorals, ending above end of anal at a short distance from point of tail. Pectorals nearly one-third of the length of the head. Teeth conical, acute, curved, subequal, uniserial in the jaws, on vomer anteriorly in a triple, posteriorly in a double series; on intermaxillary plate 9 teeth in a double series. Olivaceous above, yellowish below. Length of single specimen known 535 mm. [Type of the species in the British Museum seen by us].

Habitat: Singapore!

6. Ophichthys macrochir (Blkr.).

Ophisurus macrochir Bleeker, Verh. Bat. Gen. XXV. 1852, Muraenoid. p. 26.
Centrurophis macrochir Kaup, Cat. Apodal Fish 1856, p. 5.
Ophichthys macrochir Bleeker, Atl. Ichth. IV. 1864, p. 55.
Ophichthys macrochir Günther, Cat. Brit. Mus. VIII. 1870, p. 72.

Height 42—48; head 14.5—17.7, about one fourth of the trunk; head and trunk twice or less than twice in tail. Eye 11—13; twice or somewhat more in snout, situated in the

anterior fourth of the head. Posterior nostrils nearly below front-border of eye, anterior nostrils in a tube, somewhat shorter than eye. Snout convex, bluntly pointed; cleft of mouth $3^1/_2$ times or more in length of head, extending somewhat behind eye. Dorsal rather low, more than twice lower than height of body, commencing nearly opposite to the extremity of the pectorals or farther behind. Length of pectorals thrice or somewhat more in head. Teeth small, acute, equal, uniserial in the jaws, on the vomer irregularly biserial, on the intermaxillary plate about 6 in 2 rows. Olivaceous above, lighter below. Length 506 mm.

Habitat: Sumatra (Deli, in brackish water!, Bagan Api Api!); Java (Batavia!, Surabaya!).

In sea and brackish water.

7. Ophichthys polyophthalmus Blkr.

Ophichthys polyophthalmus Bleeker, Ned. Tijdschr. Dierk. II. 1864/65, p. 43. — Atl. Ichth. IV. 1864, p. 47.

Ophichthys polyophthalmus Günther, Cat. Brit. Mus. VIII. 1870, p. 73.

Ophichthys bleekeri Volz, Zool. Jahrb. Abth. Syst. XIX. 1903, p. 418.

Microdonophis polyophthalmus Jordan & Snyder, Bull. U. S. Fish Comm. XXVI. (1906) 1907, p. 207.

Height about 28; head more than 10, 4.9 times in trunk. Head and trunk 1.2 in length of tail. Eye more than 8, situated in the anterior third of the length of the head, two thirds of the length of the snout. Cleft of mouth of moderate width, reaching slightly behind eye, one third of the length of the head. Snout conspicuously projecting. Posterior nostrils in advance of the eye; anterior ones with a truncated tube, about as long as the eye. Origin of dorsal about opposite to the base of the pectorals. Dorsal and anal ending somewhat before point of tail. Length of pectorals equal to snout, about $5^1/_2$ times in head. Teeth of moderate size, subequal, pointed, curved, uniserial in all the bones; those on the intermaxillary plate in form of a V, the point directed forward. Brownish, on each side with 3 series of large rounded brownish-black spots arranged alternately, each spot of the dorsal series with a whitish centre. Head with numerous white, dark-edged ocelli. On the back a series of brown spots, each with a whitish centre; margin of dorsal black, a series of elongate blackish spots along its middle; anal nearly immaculate. Length 525 mm. [Type of the species in the British Museum seen by us].

Habitat: Ambon!. — Riu Kiu Islands; Hawaii.

8. Ophichthys melanochir Blkr.

Ophichthys melanochir Bleeker, Ned. Tijdschr. Dierk. II. 1864—1865, p. 44. — Atl. Ichth. IV. 1864, p. 51.
Ophichthys altipinnis Günther, Cat. Brit. Mus. VIII. 1870, p. 74 (nec Kaup).

Height 34.5; head about 13, 2.4 in trunk; head and trunk twice in tail. Eye more than 8, nearly equal to half the length of the snout, situated in the anterior half of the head. Posterior nostrils in advance of the eye, anterior nostrils in a tube, shorter than eye. Snout pointed, much projecting. Cleft of mouth about thrice in length of head, reaching scarcely beyond eye. Origin of dorsal above gillopenings. Dorsal much elevated, about as high as height of body. Anal not much lower, ending opposite to end of dorsal, not far from point of tail. Pectorals about $2^1/_2$ times in length of head. Teeth conical, pointed, curved, uniserial, subequal in jaws and vomer; on intermaxillary plate 5 stouter teeth arranged in a Λ, the point directed forward. Brownish above, yellowish below, outer border of dorsal and anal and greater part of pectorals black; pores on head surrounded by black borders, giving the head the appearance of being spotted. Length more than 700 mm. [Type of the species in the British Museum seen by us].

Habitat: Ambon!. — Maldives.

9. Ophichthys altipinnis (Kaup).

Microdonophis altipinnis Kaup, Cat. Apod. fish 1856, p. 6.
Ophisurus altipinnis Bleeker, Enumeratio spec. pisc. 1859, p. 174.
Muraenopsis altipinnis Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 180.
Ophichthys altipinnis Bleeker, Atl. Ichth. IV. 1864, p. 50.

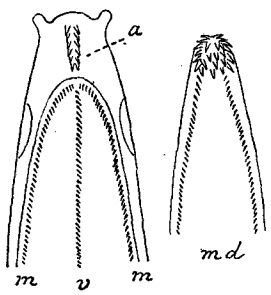

Fig. 146. Dentition of *Ophichthys altipinnis* (Kaup). (After BLEEKER). *a* teeth on intermaxillary plate, *m* maxillary, *md* mandibulary, *v* vomerine teeth.

Height about 33; head about 9.3, nearly 4 times in trunk; head and trunk 1.4 times in tail. Eyes about 19, nearly 4 times in snout. Posterior nostrils in advance of the eye, anterior nostrils in a tube, shorter than eye. Snout acutely convex, very much projecting. Cleft of mouth reaching behind eye, about $2^2/_3$ in length of head. Origin of dorsal slightly before gillopenings. Dorsal very elevated, about as high as height of body. Anal lower, ending opposite end of dorsal, not far from point of tail. Pectorals somewhat more than $2^1/_2$ times in length of head.

Teeth conical, pointed, uniserial in jaws and vomer, only anteriorly in the mandibles they are irregularly triseriate and stouter, as also those on the intermaxillary plate, which are serially arranged in 6 pairs. Brownish above, yellowish below, point of tail yellowish. Pectorals blackish; anal with a dark margin, dorsal brownish with a lighter base. Length of the single specimen described 940 mm. [Type of the species seen by us in the Leiden Museum].

Habitat: Celebes (Makassar!).

10. Ophichthys rhytidoderma (Blkr.).

Ophisurus rutidoderma Bleeker, Verh. Bat. Gen. XXV. 1852, Muraen. p. 30.
Pisoodonophis rutidoderma Kaup, Cat. Apod. fish 1856, p. 18.
Ophichthys rutidoderma Bleeker, Atl. Ichth. IV. 1864, p. 55.
Ophichthys rhytidoderma Günther, Cat. Brit. Mus. VIII. 1870, p. 63.

Height about 46; head about 21.2, about 5.8 in trunk; head and trunk about twice in tail. Eye about 15, about twice in snout, situated in the anterior fourth of the length of the head. Posterior nostrils scarcely in advance of the eye, anterior nostrils in a tube, shorter than the eye. Snout pointed, cleft of mouth nearly $4^1/_2$ times in length of head, extending scarcely behind eye. Dorsal lower than anal, about thrice lower than body, commencing at a short distance behind the extremity of the pectorals. Length of pectorals one third of that of the head. Teeth conical, pointed, fixed, subequal, biserial, except the foremost of the maxillaries; on the intermaxillary plate five or six in two rows. Olivaceous above, lighter below. Length of single specimen known 940 mm. [Type of the species in the British Museum seen by us].

Habitat: Java (Batavia!).

11. Ophichthys rhytidodermatoides (Blkr.).

Ophiurus breviceps Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 1308 (nec Richardson).
Ophisurus rutidodermatoides Bleeker, Verh. Bat. Gen. XXV. 1852, Muraen. p. 31.
Pisoodonophis rutidodermatoides Kaup, Cat. Apod. Fish 1856, p. 18.
Ophichthys rutidodermatoides Bleeker, Atl. Ichth. IV. 1864, p. 55.
Ophichthys rhytidodermatoides Günther, Cat. Brit. Mus. VIII. 1870, p. 62 (p.p.).

Height 46; head 15, four times in trunk; head and trunk about twice in tail. Eye less than 20, about thrice in snout, situated in the anterior third of the head. Posterior nostrils

scarcely in advance of the eye, anterior nostrils in a tube, shorter than eye. Snout pointed; cleft of mouth $3^1/_2$ times in length of head, extending far behind eye. Dorsal low, more than twice lower than height, commencing nearly opposite to the extremity of the pectorals. Dorsal and anal ending not far from point of tail. Length of pectorals three times in length of head. Teeth pointed, fixed, all biserial except the foremost of the maxillaries and the hindermost of the vomer, which are uniserial; on the intermaxillary plate a series of 2 pairs [1]). Olivaceous above, lighter below. Length 682 mm. [Type of the species in the British Museum seen by us].

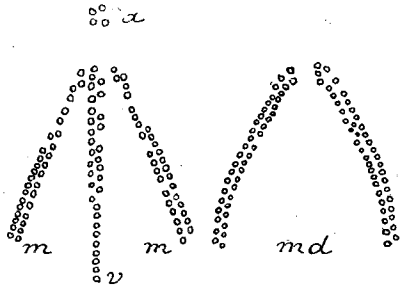

Fig. 147. Dentition of *Ophichthys rhytidodermatoides* (Blkr.). *a* teeth of intermaxillary plate, *m* maxillary, *md* mandibulary, *v* vomerine teeth. × $3^1/_2$.

Habitat: Java (Batavia!). — Pinang; Ceylon (after Karoli).

12. **Ophichthys lumbricoides** (Blkr.).

Ophisurus lumbricoides Bleeker, Verh. Bat. Gen. XXV. 1852, Muraen. p. 32.
Pisoodonophis lumbricoides Kaup, Cat. Apod. Fish 1856, p. 21.
Ophichthys lumbricoides Bleeker, Atl. Ichth. IV. 1864, p. 56.

Height 68.8; head 16.5, 4.2 times in trunk; head and trunk about twice in tail. Eye minute, about twice in snout, situated in the anterior third of head. Posterior nostrils scarcely in advance of the eye, anterior nostrils in a tube, shorter than eye. Snout pointed; cleft of mouth three times in length of head, extending far behind eye. Dorsal low, more than half height of body, commencing nearly opposite to the extremity of the pectorals. Dorsal and anal ending not far from point of tail. Length of pectorals about three times in length of head. Teeth pointed, fixed; those of the mandibles in two series, in the maxillaries an outer complete series, at the inner side of the middle of which is a short inner series; on the vomer a double series of equal teeth; those on the intermaxillary plate in two

1) We agree with GÜNTHER, that BLEEKER's figure (Plate Muraenid. XVI figure 1) of the dentition of *Ophichthys rhytidodermatoides* is totally erroneous.

pairs. Dark above, lighter below. Length 410 mm. [Type of the species in the British Museum seen by us].

Habitat: Java (Batavia!).

Note: GÜNTHER has united this species with the preceding one. We think it safer to separate them, as they differ in the height and in the dentition, which differences however may be due to difference in age.

13. Ophichthys macclellandi (Blkr.).

Ophisurus Mac Clellandi Bleeker, Verh. Bat. Gen. XXV. 1852, Muraen. p. 33.
Pisoodonophis macclellandi Kaup, Cat. Apod. fish 1856, p. 19.
Ophichthys Mac Clellandi Bleeker, Atl. Ichth. IV. 1864, p. 57.
Ophichthys macclellandi Günther, Cat. Brit. Mus. VIII. 1870, p. 63.

Height about 41; head about 16, a little less than one fourth of the trunk; head and trunk twice in length of tail. Eye about 11, about 2 times in snout, situated in the anterior fourth of the length of the head. Snout pointed; cleft of mouth about $3^1/_2$ times in length of head, extending behind eye. Posterior nostrils scarcely before eye, anterior ones in a tube, shorter than eye. Dorsal low, thrice lower than body, commencing opposite to the extremity of the pectorals. Dorsal and anal ending shortly before tip of tail. The length of the pectorals is one third of the length of the head. Teeth pointed, fixed, biserial except the anterior maxillary ones, which are uniserial and those on the vomer, which are arranged in three, and on the middle of the bone in four series. On the intermaxillary plate a group of 5 or 6 teeth arranged in two rows. Olivaceous above, lighter below. Length of the single specimen known 580 mm. [Type of the species in the British Museum seen by us].

Habitat: Java (Batavia!).

14. Ophichthys celebicus (Blkr.).

Ophisurus celebicus Bleeker, Act. Soc. Sc. Indo-neerl. I. 1856, Visschen Menado p. 70.
Ophisurus broekmeyeri Bleeker, Ibid. p. 71.
Ophichthys amboinensis Bleeker, Ned. Tijdschr. Dierk. II. 1864—1865, p. 45. — Atl. Ichth. IV. 1864, p. 54.
Ophichthys broekmeyeri Bleeker, Atl. Ichth. IV. 1864, p. 53.
Ophichthys celebicus Bleeker, Ibid. p. 54.
Ophichthys broekmeyeri Günther, Cat. Brit. Mus. VIII. 1870, p. 61.
Ophichthys broekmeyeri Perugia, Ann. Mus. Civic. Genova (2) VII. 1889, p. 277.

Height 33—36; head 9—$9^2/_5$; $2^1/_3$—$2^3/_4$ in trunk, head and

trunk about three fourths of the tail. Eye 11—12, about twice in the length of the snout, situated about in the anterior fourth of the head. Posterior nostrils slightly in advance of the eye, anterior nostrils in a tube, shorter than eye. Dorsal about twice lower than height of body, commencing above the posterior third of the pectorals [1]). Vertical fins ending near point of tail. Length of pectorals more or less than thrice in length of head. Teeth conical, fixed; anterior maxillary teeth irregularly uni-, posterior biserial, in the lower jaw irregularly biserial. Vomerine teeth bi- or triserial, those on intermaxillary plate stoutest, forming a group. Brownish above, somewhat lighter below, dorsal and anal fin darker. Length 486 mm. [Types of the three species of BLEEKER in the British Museum seen by us].

Habitat: Nias; Celebes (Makassar!, Badjoa, Menado!); Ambon!.

15. **Ophichthys versicolor** (Rich.).

Ophisurus versicolor Richardson, Ereb. & Terror, Zoology 1844, p. 103.
Elapsopsis versicolor Kaup, Cat. Apod. Fish 1856, p. 10.
Ophichthys versicolor Günther, Cat. Brit. Mus. VIII. 1870, p. 68.

Height 46. Head about 13, one-fifth of the length of the trunk; head and trunk slightly shorter than tail. Eye 11, more than twice in the length of the snout, situated in the anterior third of the head. Anterior nostrils a short tube, shorter than eye, wider at its extremity than at its commencement. Posterior nostrils opposite to frontborder of eye. Upper jaw much projecting beyond the lower; cleft of mouth extending somewhat behind eye. Dorsal low, its origin above the middle of the pectorals. Pectorals small, shorter than snout. Teeth pointed, immovable. Vomerine and mandibulary teeth in a single series, those on the vomer in the middle with indication of an irregular second series. Maxillary teeth in a single series, in the middle irregularly biserial; on the intermaxillary plate there are 9 teeth, 8 of which in a double row. Body encircled by

1) In the type of *O. celebicus* (Blkr.) in the British Museum, which is a young specimen of 200 mm. length, the distance of the origin of the dorsal from the gillopenings is much shorter than in *O. broekmeyeri* Blkr. and *O. amboinensis* Blkr. This distance measured in the length of the head is for *O. amboinensis* Blkr. [486 mm. total length] and for *O. broekmeyeri* Blkr. [327 mm. total length] 3.4 in length of head and for *O. celebicus* Blkr. = 7 times in length of head.

We agree with the observation of GÜNTHER about the teeth of *O. celebicus* Blkr.

27 brown rings, twice as broad as the interspaces between them; each ring divided into two by a narrow circular white line; dorsal fin coloured as the body underneath. Length 520 mm. [Type of the species in the British Museum seen by us].

Habitat: Moluccos. — Lord Howe Island (Waite).

8. **Brachysomophis** Kaup.

(KAUP, Cat. Apod. Fish 1856, p. 9)
(*Brachysomophides* Bleeker: Atl. Ichth. IV. 1864, p. 38).

Elongate, more or less cylindrical. Anus somewhat before or behind the middle of length. Dorsal commencing shortly or at some distance behind gillopenings. Dorsal and anal ending at a short distance before end of tail. Pectorals small or wanting. Head moderate. Snout pointed; jaws equal or the lower jaw somewhat prominent. Cleft of mouth very wide. Eyes small, situated very anteriorly and looking somewhat upward. Anterior nostrils in a tube or surrounded by a prominent wall, posterior nostrils in the upper lip, looking downward, before vertical through frontborder of eye. Tongue not free. Teeth of unequal size; caniniform on vomer and in mandibles; in the maxillaries smaller, in a double or single series. Gillopenings lateral, rather wide.

Distribution: Tropical and warm seas of Atlantic, Indic and Pacific.

Key to the indo-australian subgenera.

Pectorals present . . . . . *Brachysomophis* Kaup (s. str.) p. 313.
No pectorals . . . . . *Achirophichthys* Bleeker p. 315.

1. Subgenus **Brachysomophis** Kaup (s. str.).

(Kaup, Cat. Apodal fish 1856, p. 9).

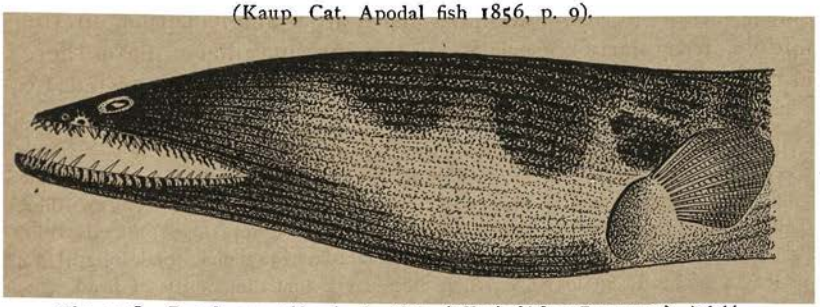

Fig. 148. *Brachysomophis cirrhochilus* (Blkr.) (After BLEEKER). × 4/5.

Lips fringed. Maxillary teeth in a double series. Pectorals present. Anus in or before middle of length.

Distribution: Indo-australian Archipelago, Indic and Pacific.

Key to the indo-australian species of subgenus Brachysomophis.

1. Pectorals 10—11 times in head. Colour uniform. . . . *B. crocodilinus* p. 314.
2. Pectorals 4—5 times in head. Large black spots and bands . . . . . *B. cirrhochilus* p. 315.

1. Brachysomophis (Brachysomophis) crocodilinus (Benn.).

Ophisurus crocodilinus Bennett, Proc. Zool. Soc. London 1833, p. 32.
Brachysomophis horridus Kaup, Cat. Apodal fish 1856, p. 9.
Brachysomophis horridus Bleeker, Versl. Akad. Amsterdam (2) II. (1867) 1868, p. 303.
Ophichthys crocodilinus Günther, Cat. Brit. Mus. VIII. 1870, p. 64.
Brachysomophis crocodilinus Jordan & Snyder, Proc. U.S. Nat. Mus. XXIII. 1901, p. 875.
Ophichthys crocodilinus Günther, Fische d. Südsee Heft IX. 1910, p. 398.

Height about 21; head $7^1/_3$—$7^5/_6$, 2.8—3 times in trunk; head and trunk somewhat shorter or longer than tail. Eye 15, situated about in the anterior ninth of the length of the head. Snout extremely short, rather flattened, broader than long, as long as or longer than eye; lower jaw somewhat prominent. Cleft of mouth somewhat less than 3 times in length of head. Lips fringed by a single series of papillae. Vertical fins more than twice lower than height of body; dorsal commencing about $^2/_5$ of the length of the head behind the gillopenings. Dorsal and anal ending about half length of cleft of mouth before point of tail. Pectorals small, 10—11 times in head. Maxillary teeth in a double series, those of the inner series stronger and less numerous than the outer one. Mandibulary teeth caniniform, widely set in one series; as also those of the vomer. On the intermaxillary plate about 4 or 5 teeth in a transverse series; the lateral ones the largest. Gillopenings wide. Brownish above, lighter below. A series of black pores along the lateral line; occiput with a transverse series of yellowish spots. Length 1375 mm. [After BLEEKER and GÜNTHER, and a specimen of 330 mm. seen by us in the Leiden Museum].

Habitat: Sangir-Islands. — South Arabia; Mauritius; Japan; Tahiti; Savai; Galapagos Islands.

2. Brachysomophis (Brachysomophis) cirrhochilus (Blkr.). [Fig. 148, p. 313].

Ophisurus cirrhocheilos Bleeker, Act. Soc. Sc. Indo-neerland. II. 1859, 8. Bijdr. vischfauna Ambon, p. 89.
Brachysomophis cirrhochilus Bleeker, Atl. Ichth. IV. 1864, p. 38.
Ophichthys cirrochilus Günther, Cat. Brit. Mus. VIII. 1870, p. 65.

Height 26; head $8^2/_3$—$9^3/_5$, thrice to three and a half in trunk. Head and body about equal to tail or tail somewhat longer. Eye about 14—31, $1^1/_2$—$3^1/_3$ in snout, situated in the anterior fifth of the length of the head. Snout short and rather flattened; the lower jaw slightly prominent. Cleft of mouth $2^1/_5$—$2^1/_2$ in length of head. Lips fringed with numerous, generally bifid filaments. Vertical fins well developed, more than thrice lower than height of body, ending at a distance from tip of tail somewhat more or less than length of pectorals. Dorsal beginning behind the gillopenings at a distance equal to two thirds or less of the length of the head. Pectorals about 4—5 times in head. Maxillary teeth in a double, mandibulary teeth in a single series; teeth widely set, caniniform, the hindermost smaller. The vomerine teeth still larger, in a single series; those of the intermaxillary plate anteriorly smaller and in a semicircle, followed by 2 large canines, one behind the other, which are continuous with the vomerine series. Gillopenings wide. Brownish, with large, irregular, dark, transverse spots and bands; fins yellowish, edged with brown. Length 1240 mm. [After BLEEKER and a specimen of 550 mm. length in the Leiden Museum].

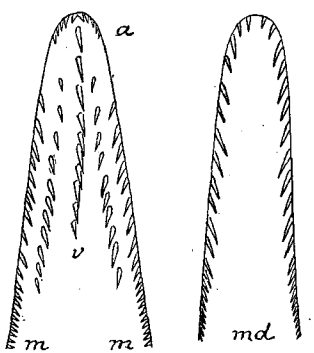

Fig. 149. Dentition of *Brachysomophis cirrhochilus* (Blkr.). *a* intermaxillary, *m* maxillary, *md* mandibulary, *v* vomerine teeth. (After BLEEKER).

Habitat: Ambon!. — Formosa; Muscat (Arabia).

2. Subgenus Achirophichthys Bleeker.

(BLEEKER, Ned. Tijdschr. Dierk. II. 1864, p. 41).

Lips not fringed or only with one row of minute tubercular papillae. Maxillary teeth in a single or double series. No pectorals. Anus behind the middle of the length.

Distribution: Indo-australian Archipelago.

Key to the species of Achirophichthys.

1. Maxillary teeth in a single series, lips not papillated. *B. (A.) kampeni* p. 316.
2. Maxillary teeth in a double series; lips papillated. . . *B. (A.) typus* p. 317.

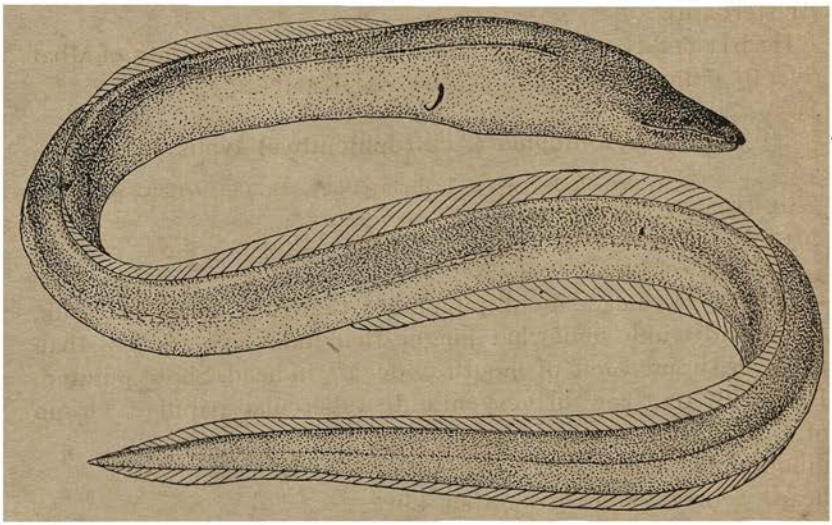

Fig. 150. *Brachysomophis (Achirophichthys) kampeni* n. sp. Nat. size.

1. Brachysomophis (Achirophichthys) kampeni n. sp.

Height 29; head 8, 3 times in trunk. Head and trunk somewhat longer than tail. Eye somewhat prominent, about 20, about $1^1/_2$ times in length of snout. Cleft of mouth wide, thrice in head. Snout pointed. Lips not fringed. Origin of dorsal at a distance behind the gillopenings equal to about $^2/_9$ length of head. Dorsal and anal rather low, ending at some distance before the point of the tail. In the jaws a single series of compressed, recurved teeth, situated close together, in the mandibles a few canine teeth besides. On the intermaxillary plate a curved series of about 5 canine teeth, on the vomer a single series of 5 rather widely set teeth, of which the posterior 4 are large canines, a single

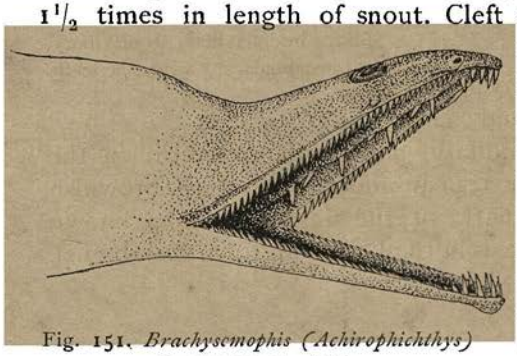

Fig. 151. *Brachysomophis (Achirophichthys) kampeni* n. sp. × 3.

smaller one between them. Dark brownish above, lighter below, fins yellowish. Length of the single specimen known 323 mm. [Type of the species in the zoological Museum of Amsterdam].

Habitat: New Guinea (Humboldt Bay near mouth of Mbai river!); collected by Dr. P. N. VAN KAMPEN.

2. Brachysomophis (Achirophichthys) typus Blkr.

Achirophichthys typus Bleeker, Ned. Tijdschr. Dierk. II. 1864—1865, p. 42. — Atl. Ichth. IV. 1864, p. 39.

Achirophichthys typus Günther, Cat. Brit. Mus. VIII. 1870, p. 65. — Fische der Südsee Heft IX. 1910, p. 398.

Height 26; head about $7^3/_4$, more than $2^1/_2$ times in trunk. Head and trunk somewhat longer than tail. Eye 16, less than twice in snout. Cleft of mouth wide, $2^3/_4$ in head. Snout pointed. Lips with one row of very minute tubercular papillae. Origin of dorsal at a distance behind the gillopenings equal to $^1/_3$ length of head. Dorsal and anal rather low, ending at some distance before the point of the tail. In the upper jaw a double series of conical teeth; the outer series situated close together, the inner series shorter, situated at some distance from the outer series, the teeth more widely set. In the mandibles a single series, the anterior teeth caniniform, widely set, the posterior teeth small and close together. On the intermaxillary plate 2 large teeth, on the vomer a series of 4 widely set caniniform teeth. Dark brownish above, lighter below. Length of the single specimen known 210 mm. [Type of the species in the British Museum seen by us].

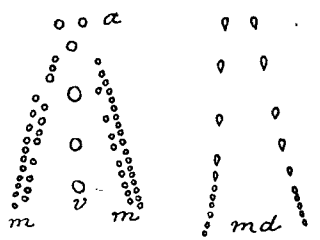

Fig. 152. Dentition of *Brachysomophis (Achirophichthys) typus* Blkr. *a* intermaxillary, *m* maxillary, *md* mandibulary, *v* vomerine teeth. × $3^1/_2$.

Habitat: Celebes!.

9. Sphagebranchus Bloch.

(BLOCH, Ausländ. Fische IX. 1795, p. 88).

Much elongate, cylindrical. Anus somewhat before or behind middle of length. Origin of dorsal above or generally more or less behind gillopenings. Dorsal and anal sometimes wanting or very low, not confluent, ending at a short distance from

end of tail. Pectorals wanting. Head short or moderate; snout pointed, projecting beyond mouth, the cleft of which reaches behind or far behind eye. Lips without filaments. Eyes small,

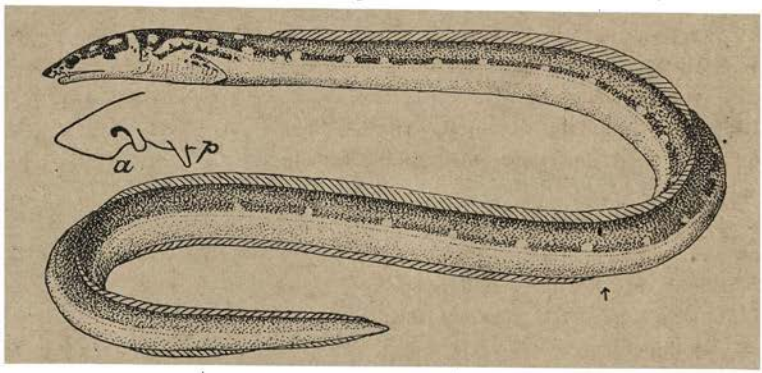

Fig. 153. *Sphagebranchus polyophthalmus* (Blkr.) nat. size. Small figure: anterior part of head magnified: *a* anterior nostril, *p* labial papilla outside of slit of posterior nostril.

situated before or above the middle of the cleft of the mouth. Posterior nostrils a slit in the border of the upper lip, looking downward; anterior nostrils in a tube at the border of the upper lip or at the ventral surface of the prominent part of the snout or they are slits in a low papilla on the last-named place. Teeth pointed, uniserial, those of the vomer may be biserial, equal in size or the vomerine ones are stouter. No scales, lateral line present. Gillopenings small, close together, ventral, longitudinal, oblique or vertical; the gillmembrane may form anteriorly a duplicature (see figure 154).

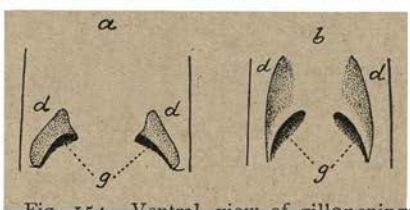

Fig. 154. Ventral view of gillopenings *(g)* with the anterior and superior duplicature *d* of the gillmembranes of *a. Sphagebranchus polyophthalmus* (Blkr.), *b. Sphagebranchus orientalis* (Mc Clell.).

Distribution: Temperate and tropical seas. They burrow in sand. Some species entering fresh water.

Key to the indo-australian species of Sphagebranchus.

I. Gillopenings ventral, oblique or longitudinal slits, anteriorly (superiorly) provided with a duplicature of the gillmembrane (see figure 154).

1. No vertical fins; head and trunk $1^1/_2$ times in tail . . . . . *Sph. vulturis* p 319.
2. Vertical fins present but low.
   a. Distance of origin of dorsal from gillopenings 2.3—4 times in head . . . . . *Sph. polyophthalmus* p. 320.
   b. Distance of origin of dorsal from gillopenings 7 times in head . . . . . *Sph. orientalis* p. 321.

II. Gillopenings more or less ventral, vertical, oblique or longitudinal slits, their gillmembrane without duplicature.
   A. Vertical fins forming a rudiment only quite near end of tail . . . . . *Sph. klazingai* p. 321.
   B. Dorsal very low or well developed.
      1. Origin of dorsal above or shortly behind gillopenings.
         a. Vomerine teeth much stouter than teeth of jaws.
            α. Head 2.6—2.8 times in trunk. Eye above anterior third of cleft of mouth. *Sph. mindora* p. 322.
            β. Head 3—$3^1/_2$ times in trunk. Eye above middle of cleft of mouth. . . *Sph. macrodon* p. 323.
         b. All teeth equally small.
            α. Head 4.7 times in trunk; teeth uniserial; cleft of mouth $3^1/_2$ times in head . . . . . *Sph. bicolor* p. 323.
            β. Head 6 times in trunk; vomerine teeth biserial; cleft of mouth 3 times in head . . . . . *Sph. lumbricoides* p. 324.
            γ. Head 6.6 times in trunk; teeth uniserial; cleft of mouth more than 5 times in head . . . . . *Sph. misolensis* p. 324.
      2. Origin of dorsal more than half length of head behind gillopenings.
         a. Head 6.3 times in trunk; teeth uniserial. *Sph. kaupi* p. 325.
         b. Head 5 times in trunk; vomerine teeth biserial . . . . . *Sph. moluccensis* p. 325.
         c. Head 4.1 times in trunk; teeth uniserial. *Sph. gjellerupi* p. 326.

1. Sphagebranchus vulturis [1]) n.sp.

Height about 48; head 10.4 (measured from posterior end of gillopenings), 3 times in trunk; head and trunk 1.5 times in

1) Named after the Government Fisheries Investigation Ship "Gier" = vultur.

tail. Eye very small, about 20, more than twice in snout, situated above anterior third of cleft of mouth. Posterior nostrils a long slit in the upper lip, looking downward, below eye; anterior nostrils curved, denticulated slits in a low papilla near tip of the ventral surface of the snout. Snout pointed, 5.7 in head, its conical part surpassing lower jaw with about 3 eye-diameters. Cleft of mouth 4.6 in head, reaching far behind eye. Dorsal and anal wanting. Teeth pointed, uniserial, those in vomer and mandibles stouter, on intermaxillary plate 5 stouter teeth in a Λ, the point directed forward. Gillopenings ventrally situated longitudinal slits, converging anteriorly and separated here by a distance of nearly a third of their length, which is about equal to 3 eyediameters. Anterior (upper) fold of gill-membranes forms a duplicature. Colour of single alcohol specimen reddish blue. Length of single specimen known 240 mm. [Type of the species in the zoological Museum of Amsterdam].

Habitat: Island Nasi besar, near West point of Sumatra; collected by the Government Fisheries Investigation Ship "Gier".

Note. This species seems to be closely allied to *Ichthyapus acutirostris* (Brisout de Barneville).

2. **Sphagebranchus polyophthalmus** (Blkr.). [Fig. 153, 154, p. 318].

Dalophis polyophthalmus Bleeker, Nat. Tijdschr. Ned. Indië IV. 1853, p. 299.
Anguisurus punctulatus Kaup, Cat. Apodal Fish 1856, p. 24.
Sphagebranchus polyophthalmus Kaup, Ibid. p. 26.
Sphagebranchus polyophthalmus Bleeker, Atl. Ichth. IV. 1864, p. 70.
Ophichthys polyophthalmus Günther, Cat. Brit. Mus. VIII. 1870, p. 85.
Ophichthys polyophthalmus Volz, Zool. Jahrb. System. XIX. 1903, p. 416.
Ophichthys punctulatus Günther, Fische d. Südsee IX. 1910, p. 403.

Height 28—35; head 8 to more than 9, more than thrice to $4^1/_2$ times in trunk; head and trunk somewhat longer than tail. Eye about 13—18, more than twice in snout. Posterior nostrils a slit in the upper lip, before the eye, provided with a conspicuous pendulous papilla, anterior nostrils a rather long slit in a broad, low papilla at some distance from the tip of the snout. Snout pointed, convex, prominent. Cleft of mouth more than $2^1/_2$ times in length of head, extending far behind eye. Dorsal very low, somewhat higher on tail, the distance of its origin from gillopenings 2.3 to 4 times in length of head. Anal very low. Dorsal and anal reaching nearly to end of tail. Teeth pointed, recurved, uniserial, on the intermaxillary plate

5 teeth in a Λ, the point directed forward. Gillopenings strongly oblique, small, rather close together, their distance about equal to their length. Superiorly and anteriorly before them is a duplicature of their anterior membrane. Colour of upper half brownish, lower half yellowish. Upper surface of head and neck with a double row of yellow round spots or ocelli, vertex with a yellow transverse streak; pores of lateral line in a yellow spot. Length more than 325 mm.

Nom. indig.: Tindjankassik (Priaman).

Habitat: Sumatra (Priaman); Nias!; Island Nako!; Java (South coast); Madura-strait!; Batjan. — Samoa, Tahiti, Viti Levu.

This eel burrows in sandy shores. The javanese fishermen dig for it and use it as a bait.

3. Sphagebranchus orientalis (Mc Clell.) [Fig. 154, p. 318].

Dalophis orientalis Mc Clelland, Calcutta Journ. Nat. Hist. V. 1845, p. 213.
Lamnostoma pictum Kaup, Cat. Apod. fish 1856, p. 23.
Sphagebranchus orientalis Kner, Novara Fische, 1865—1867, p. 380.
Ophichthys orientalis Günther, Cat. Brit. Mus. VIII. 1870, p. 87.
Ophichthys orientalis Day, Fishes of India 4°. 1878—1888, p. 665.
Ophichthys orientalis Sauvage, Hist. nat. de Madagascar XVI. Poissons 1891, p. 501.

Head 8, 3.1 times in trunk; head and trunk slightly longer than tail. Eye about 20, about 5 times in snout. Snout pointed, strongly prominent, with the anterior nostrils on its lower surface. Cleft of mouth one fourth of length of head. Distance of origin of dorsal from gillopenings one seventh of length of head. Dorsal and anal low, ending somewhat before tip of tail. Teeth acute, equal, uniserial. Gillopenings on the ventral side forming oblique slits, which are anteriorly converging with their curved anterior part. Their anterior membrane forms a double fold. Brownish above, yellowish below. Length over 300 mm. [Description made after a specimen of 196 mm. in the British Museum from British New Guinea, the only specimen known from our faunistic province].

Habitat: British New Guinea!. — Southern India; Ceylon; Madagascar.

4. Sphagebranchus klazingai M. Web.

Sphagebranchus Klazingai Max Weber, Siboga-Expeditie, Fische 1913, p. 47.

Height 51; head 12.7, 5 times in trunk; head and trunk

about equal to length of tail. Eye about 10, about twice in snout, situated above tip of lower jaw. Posterior nostrils a slit in upper lip, below eye; anterior nostrils in a short tube situated near point of cone of snout. Snout conical, very strongly prominent. Cleft of mouth 4 times in head and extending about wo eye-diameters behind eye. Dorsal and anal visible near

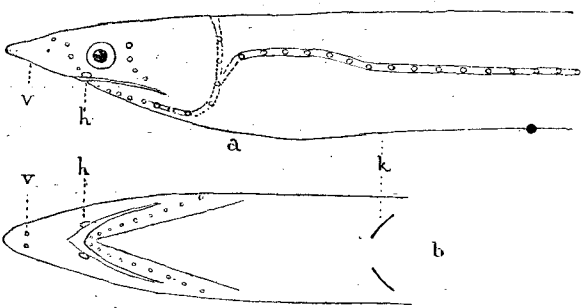

Fig. 155. *Sphagebranchus klazingai* M. Web.
a lateral, *b* ventral view; *v* anterior, *h* posterior nostril, *k* gillopening.

tip of tail only. Gillopenings longer than eye, situated ventrally and converging anteriorly. Yellowish with indication of small, dark patches, head with light marmorations. Length 127 mm. [Type of the species in the zoological Museum of Amsterdam].

Habitat: Banda, sandy bottom between 9 and 45 M. depth!

5. Sphagebranchus mindora (Jord. & Rich.)

Coecula mindora Jordan & Richardson, Bull. Bur. fisheries XXVII. (1907) 1908, p. 239.

Sphagebranchus mindora de Beaufort, Bijdr. Dierk. Amsterdam, afl. 19. 1913, p. 99.

Height 25—30; head 7.7, 2.6—2.8 in trunk, head and trunk slightly shorter than tail. Eye about 17—25, somewhat more than twice in snout, situated above end of anterior third of cleft of mouth. Snout pointed, its tip rounded, prominent; cleft of mouth 2.5 times in length of head, reaching far behind eye. The distance of the origin of dorsal from gillopenings 4—4.6 in length of head. Dorsal and anal well developed, low; height of dorsal about $^1/_6$ of height of body; anal, at least its anterior part, as also posterior part of dorsal, twice as high. Both fins ending opposite to each other shortly before end of tail. Teeth acute, recurved, uniserial, those of the vomer much larger and stouter, about 6—10, separated from each other. On the

intermaxillary plate 3—5 stout teeth in a curved series. Gill-openings nearly vertical, separated by an interspace of their own length. Upper half greyish brown, lower half yellow; the pores of the lateral line in a yellow round spot; those of head in smaller spots, forming a transverse band on the vertex. Length nearly 400 mm.

Habitat: Waigeu (in river Waihŏ, above mouth in fresh water!). — Mindora Island, Philippines.

6. Sphagebranchus macrodon Blkr.

Sphagebranchus macrodon Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 184. — Atl. Ichth. IV. 1864, p. 69.

Ophichthys macrodon Günther, Cat. Brit. Mus. VIII. 1870, p. 85. — Fische d. Südsee Heft IX. 1910, p. 402.

Height about 35; head $8^1/_2$ or somewhat more, $3—3^1/_2$ times in trunk; head and trunk equal to or somewhat shorter than tail. Eye about 12—17, less than twice in snout, situated above middle of cleft of mouth. Snout pointed, cleft of mouth one third of length of head or somewhat more. Origin of dorsal shortly behind branchial openings. Dorsal more than thrice lower than body, somewhat lower than anal. Both ending opposite to each other, shortly before end of tail. Teeth acute, recurved, unequal, uniserial, only the 4 on the intermaxillary plate in two series, and stouter, as also the single series of about 8 teeth or less on the vomer. Dark-olivaceous above, light below. Length 500 mm. [After BLEEKER and GÜNTHER and a specimen in the Leiden Museum seen by us].

Habitat: Borneo; Roti Island. — Viti-Levu.

In sea.

7. Sphagebranchus bicolor (Kaup).

Lamnostoma bicolor Kaup, Cat. Apod. fish 1856, p. 24.

Sphagebranchus bicolor Kaup, Abh. Nat. Verein. Hamburg, IV. 2, 1860, p. 15 (emendatio).

Sphagebranchus bicolor Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 185. — Atl. Ichth. IV. 1864, p. 69.

Height about 45; head nearly 12, 4.7 times in trunk; head and trunk somewhat shorter than tail. Eye 16, more than twice in snout. Posterior nostrils a slit in the upper lip, situated below eye, anterior nostrils in a short tube on lower surface of snout. Snout pointed, somewhat convex, much prominent.

Cleft of mouth 3.5 times in head, extending far behind eye. Dorsal about thrice lower than body, commencing immediately behind gillopenings; anal somewhat higher than dorsal, ending opposite to end of dorsal. Teeth acute, recurved, uniserial, those on the intermaxillary plate in a V, the point directed forward. Dark above, light below. Length of the single specimen known 425 mm. [Type of the species in the Leiden Museum seen by us].

Habitat: Borneo!.

8. Sphagebranchus lumbricoides Blkr.

Sphagebranchus lumbricoides Bleeker, Ned. Tijdschr. Dierk. II. 1864—65, p. 46. — Atl. Ichth. IV. 1864, p. 71.
Ophichthys timorensis Günther, Cat. Brit. Mus. VIII. 1870, p. 86.
Ophichthys timorensis Johnstone, Pearl Oyster Rep. II. Fishes 1904, p. 205.

Height about 60; head 17, about six times in the trunk; head and trunk a little shorter than tail. Eye 14, more than twice in snout. Snout pointed; cleft of mouth about thrice in length of head, reaching far behind eye. Dorsal and anal very low, almost absent, the dorsal commencing above the gill-openings; the anal begins to be distinct at some distance behind the anus. Teeth pointed, uniserial, those on the intermaxillary plate and on the anterior part of the vomer, biserial. Length about 230 mm. [After BLEEKER, GÜNTHER and JOHNSTONE and the damaged type of the species in the British Museum seen by us].

Habitat: Timor!. — Ceylon (Cheval Paar).

9. Sphagebranchus misolensis (Gthr.).

Ophichthys misolensis Günther, Ann. Mag. Nat. Hist. X. 1872, p. 425. — Brenchley's Cruise of the "Curaçao". 1873, p. 430.
Dalophis misolensis Jordan & Seale, Bull. Bur. of fish. Washington XXV. (1905) 1906, p. 194.

Height 56.5; head 15, 6.6 in trunk; tail as long as head and trunk. Eye small, about 15, above the middle of the cleft of the mouth, which is of moderate width and goes 5.7 times in head. Snout pointed, more than twice as long as the eye, projecting beyond the mouth. Anterior nostrils in a very short tube, posterior on the inner side of the lip, below the front margin of the eye. Dorsal and anal fins low, the former commencing at a very short distance behind the gillopenings, the latter

immediately behind the vent. Teeth equally small, pointed, uniserial. Gillopenings somewhat oblique, lateral, separated by about their own length. Coloration uniform. Length 283 mm. [Type of the species in the British Museum seen by us].

Habitat: Misol Island!.

10. Sphagebranchus kaupi Blkr.

Sphagebranchus Kaupi Bleeker, Act. Soc. Sc. Indo-neerl. V. 1858—59, Twaalfde Bijdr. Celebes p. 3. — Atl. Ichth. IV. 1864, p. 70.
Ophichthys kaupi Günther, Cat. Brit. Mus. VIII. 1870, p. 86.

Height about 59; head 15.9, 6.3 times in trunk; head and trunk 1.2 times in tail. Eye 11—12, about twice in snout. Posterior nostrils a slit in the upper lip, below front margin of eye, anterior nostrils in a tube, shorter than eye. Snout pointed, convex, very prominent. Cleft of mouth about 4 times in head, extending a little behind eye. Dorsal more than twice as low as height of body, commencing more than half length of head behind gillopenings; anal as high as dorsal, both ending opposite. Teeth pointed, recurved, uniserial, those on the intermaxillary plate in a V, the point directed forward. Gillopenings moderate, semilunar. Olivaceous above, lighter below. Length of single specimen known 350 mm. [Type of species in the British Museum seen by us].

Habitat: Celebes (Klabat di atas) in a river!.

11. Sphagebranchus moluccensis (Blkr.)

Dalophis moluccensis Bleeker, Nat. Tijdschr. Ned. Indië, V. 1853, p. 246. — Verh. Batav. Gen. XXV. 1853, Muraenoid. p. 70.
Sphagebranchus moluccensis Kaup, Cat. Apod. fish 1856, p. 26.
Sphagebranchus moluccensis Bleeker. Atl. Ichth. IV. 1864, p. 68.
Ophichthys moluccensis Günther, Cat. Brit. Mus. VIII. 1870, p. 85.

Height about 35; head 13, 5 in trunk; head and trunk a little shorter than tail. Eye about 13, less than twice in snout. Posterior nostrils a slit in upper lip situated scarcely before eye, anterior nostrils in a tube, shorter than eye. Cleft of mouth extending behind eye, $3^1/_2$ times in head. Dorsal well developed and commencing more than half length of head behind gillopenings; anal higher than dorsal, ending opposite to end of dorsal. Teeth pointed, uniserial, biserial on intermaxillary plate and on vomer. Gillopenings large, semilunar. Brownish above,

yellowish below. Length 404 mm. [Type of the species in the Leiden Museum seen by us].

Habitat: Batjan; Ceram!. — ?Hongkong (Jouan).

In sea.

12. Sphagebranchus gjellerupi n. sp.

Height more than 40; head 11.7, 4.1 times in trunk; head and trunk 1.2 times in tail. Eye small, about 12, nearly twice in snout, situated above middle of cleft of mouth. Posterior nostrils a slit in the border of the upper lip, looking downward, below front border of eye; anterior nostrils in short tubes on the ventral surface of the prominent part of the snout. Snout pointed, about 6 times in head, its prominent part surpassing the lower jaw with about one eye-diameter. Cleft of mouth 4.3 times in head, reaching behind eye. Dorsal and anal low, increasing in height posteriorly on tail, where they end opposite to each other near end of tail. Teeth pointed, uniserial, a group of about 3 on the intermaxillary plate. Gillopenings small, vertical slits, slightly longer than eye; the distance of their ventral ends more than their own length. Colour of the single alcohol specimen yellowish brown, powdered with dark, fine points. Length of the single specimen known 152 mm. [Type of the species in the Zoological Museum of Amsterdam].

Habitat: Dutch North New Guinea, Tanah Merah in a brook near shore; collected by Dr. K. GJELLERUP.

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8. Fam. NEMICHTHYIDAE.

Slender, more or less compressed, very elongate, tapering to the end of the tail, which may be filamentous. Anus near gillopenings or farther behind. Scaleless, lateral line with or without pores. Dorsal and anal long and confluent with the reduced caudal or extending to the end of the filamentous tail. Pectorals well developed but small. Snout produced, but extremely slender, more or less recurved upward [1]), formed

1) It is possible that the curve upward formed by the snout and downward by the lower jaw is only a consequence of the manner in which the specimens died or were preserved. We offer this opinion with regard to the specimen of *Nemichthys scolopaceus*, which was taken alive and has been described and figured by ROULE (Ann. Inst. océanogr. I. fasc. 6, 1910). In this specimen the jaws are straight (see p. 329).

by the long vomero-ethmoid and at its base by the much shorter maxillaries; lower jaws equally produced, slender and recurved [1]). Cleft of mouth reaching behind eye. Eyes moderate. Nostrils close together near frontborder of eye. Tongue not free. Vomer and jaws with close set teeth, the point of which may be directed backward. Gillopenings wide, separated by a small interspace, where the gillmembranes are united to the isthmus. Branchial openings in pharynx are wide slits.

Distribution: Bathypelagic fishes of the warm and temperate seas.

Key to the indo-australian genera of Nemichthyidae.

1. Anus immediately behind pectorals. Origin of dorsal before that of pectorals. Jaws equal in length.
   a. L. l. without pores . . . . . *Cercomitus* p. 327.
   b. L. l. with 3 series of pores . . . . . *Nemichthys* p. 328.
2. Anus far distant from pectorals. Origin of dorsal behind that of pectorals. Jaws unequal in length.
   a. Origin of dorsal behind that of anal . . . . . *Serrivomer* p. 331.
   b. Origin of dorsal immediately behind base of pectorals. *Avocettina* p. 333.

1. Cercomitus M. Weber.

(Max Weber, Siboga-Exp. Fische 1913, p. 54).

Very slender and elongate, compressed, tapering from the middle of the length to pectorals and strongly to the end of the tail, which is transformed into a very thin flagellum. Anus at a short distance from base of pectorals. Origin of dorsal at some distance before that of pectorals. Anal originating immediately behind anus, its membrane reaching the point of the flagellum. Headbones very thin and transparent. Head of moderate size, tapering into the long, exceedingly narrow jaws, which are of equal size, strongly diverging [1]) and somewhat swollen at their end; the upper jaw strongly curved upwards. Nostrils close together, somewhat before eye, rounded. Eyes situated high, their upper border in the dorsal profile. Jaws and vomer closely set with small teeth, the point of which is directed backwards. No scales. Lateral line without pores. Gillopenings narrow, situated before and below pectorals.

1) See note on page 326.

Distribution: Bathypelagic; Indo-australian Archipelago (959—2060 M.).

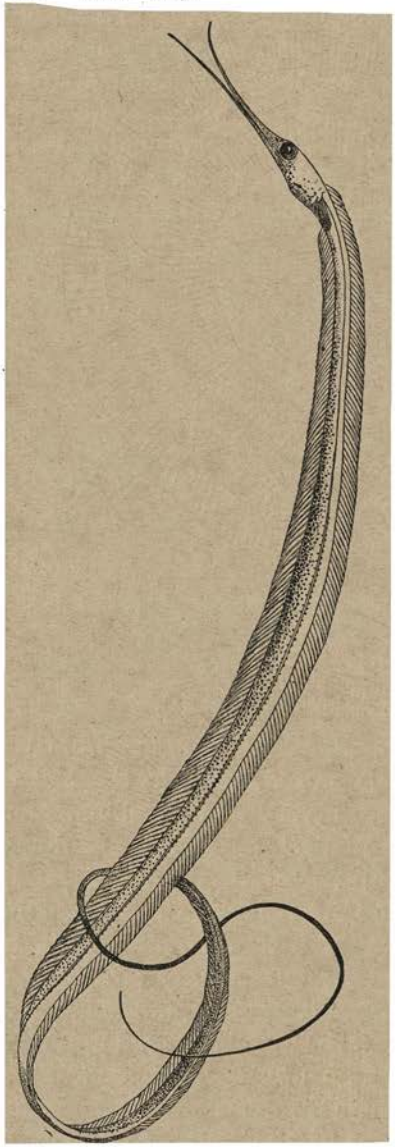

Fig. 156. *Cercomitus flagellifer* M. Web.

1. Cercomitus flagellifer M. Web.

Cercomitus flagellifer Max Weber, Siboga-Exp. Fische, 1913, p. 55.

Height 7.3—11.3; head about 10; eye 9.7—11.8, 2.1—2.4 in postorbital part of head, more than twice as long as concave interorbital space. Snout about $^3/_4$ of length of head. Origin of dorsal somewhat before middle between occiput and base of pectorals. Rays and membrane of dorsal weaker than those of anal. Pectorals 6.4—7 in length of head. Colour of alcohol specimens yellowish, with scattered dark spots, which are more crowded towards the ventral surface. These pigment spots are also present below the eye. End of tail blackish. Length 550 mm.

Habitat: Flores sea (2060 M. mud)!; Savu-sea (959 M. globigerine ooze)!.

2. Nemichthys Richardson.

(Richardson, Zoology Voy. Samarang, Fishes 1848, p. 25).

Exceedingly elongate and slender, tapering towards tail. Anus below base of pectorals. Pectorals and vertical fins well developed. Origin of dorsal above gillopenings; that of anal immediately behind anus. Head comparatively stout. Jaws produced into a long, slender bill, straight, recurved

only in preserved specimens [1]), not expanded at the tip. Nostrils close together near eye. Eyes large. Jaws and vomer with

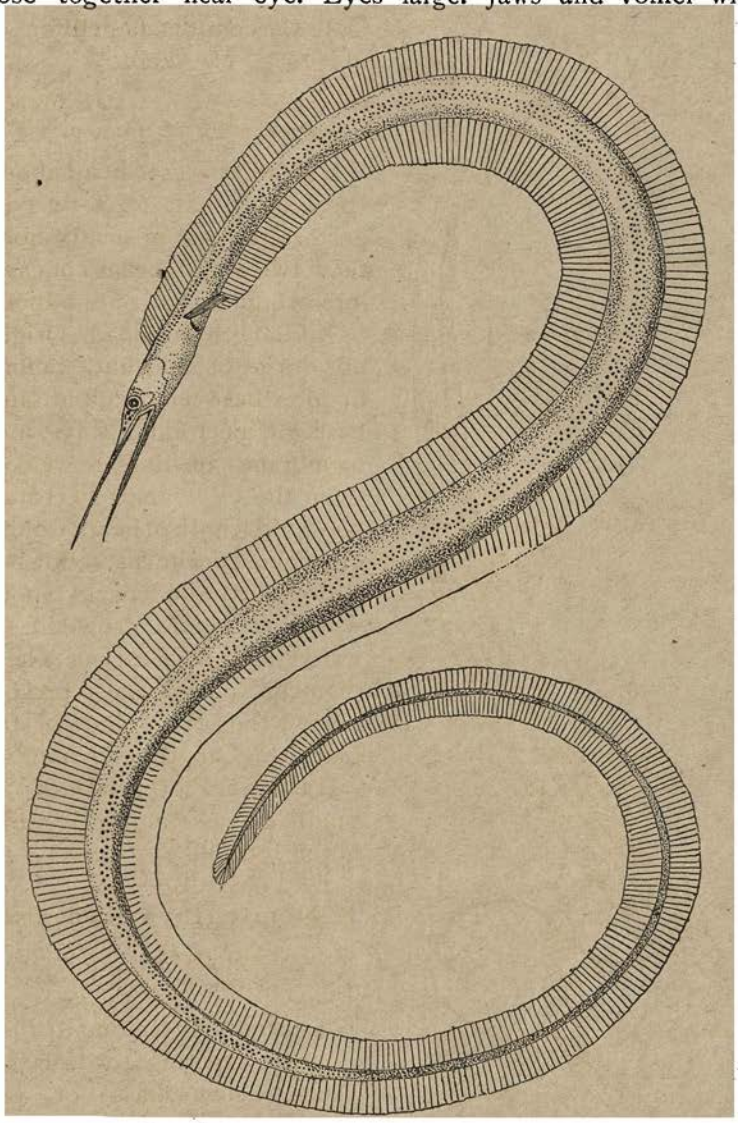

Fig. 157. *Nemichthys scolopaceus* Rich. (After ROULE) × 1/3.

small close-set teeth, their point directed backward. Tongue

1) See note on pag. 326.

not free. No scales; lateral line distinct, with 3 series of pores. Gillopenings wide, running downward and forward, nearly confluent.

Distribution: Bathypelagic (334—4330 M.). Atlantic, Indic and Pacific, between about 30° N.—50° S.

1. **Nemichthys scolopaceus** Rich. [Fig. 157, p. 329].

Nemichthys scolopaceus Richardson, Zool. Voy. Samarang Fishes 1848, p. 25.
Leptorhyncus Leuchtenbergii Lowe, Mém. Acad. St. Pétersbourg, Mém. Sav. étrang. 1854, p. 171.
Belonopsis Leuchtenbergii Lowe, Ibid. p. 174.
Nemichthys scolopacea Günther, Cat. Brit. Mus. VIII. 1870, p. 21.
Nemichthys scolopaceus Peters, Sitzber. Akad. Berlin (1876) 1877, p. 849.
Nemichthys scolopaceus Brauer, Deutsche Tiefsee-Exped. Tiefseefische 1906, p. 126 (see syn.).
Nemichthys scolopaceus Roule, Ann. Inst. Océanogr. I. fasc. 6, 1910, p. 1.

Fig. 158. *Nemichthys scolopaceus* Richardson (After A. Brauer).

D. more than 300 rays; P. 11.

Height 57—72; head 10—11. Eye about $^1/_3$ of postorbital part of head, 7 times in snout (in large specimens). Rays in the second third of the length of the dorsal after Brauer [1]), destitute of membrane, spinelike and much shorter than the rays in the first and last third, which are much

1) L. Roule (l. s. c. p. 3) says: "La nageoire dorsale est fine et délicate. Sa membrane est très mince; aussi paraît-elle manquer, ou se réduire à quelques tractus basilaires, dans la majeure partie de la région denticulée; son bord dépasse les rayons. Cette nageoire se différencie en trois régions: deux filamenteuses et terminales, l'une antérieure, l'autre postérieure; une denticulée et intermédiaire.

longer but shorter than the anal rays. Pectorals nearly equal to height of head. Cleft of mouth reaching behind eye. Ventral surface blackish, back lighter. Length 1445 mm. [Not seen by us].

Distribution: North of New Guinea (Gazelle). — Mediterranean. Southern Atlantic: Madeira, West Coast of Northern Africa (888 M.), Cape Verde Islands (1694 M.); East coast of North America between 31° and 42° N. Lat. in 395 to 4332 M. depth.

3. Serrivomer Gill & Ryder.

(GILL & RYDER, Proc. U. S. Nat. Mus. VI. (1883) 1884, p. 260).

Slender, elongate, moderately compressed, tapering from the body to the snout and to the end of the tail. Anus at the end of the first or in the beginning of the second fourth of the length. Origin of dorsal behind that of anal; origin of anal about in the middle between pectorals and origin of dorsal. Vertical fins confluent. Pectorals small, situated rather high. Head rather long, pointed. Eyes situated high. Nostrils conti-

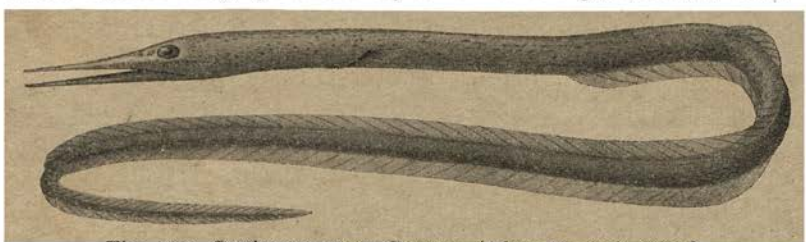

Fig. 159. *Serrivomer sector* Garman. (After BRAUER). × 0.8.

guous, small, near the eye on the level of its upper margin, the anterior a short tube. Snout pointed, somewhat curved upwards, the jaws diverging [1]), the lower slightly longer, cleft of mouth reaching behind posterior border of eye. Teeth in the anterior third of the jaws small, compressed and in several rows, in the second third larger, lancet-shaped, depressible and in a single row, in the last third small, less compressed. Vomerine

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Les deux premières n'ont que des rayons filamenteux, étroits et fragiles; la dernière possède, outre les rayons filamenteux, des rayons gros et courts, en acicules."

This is not in accordance with his figures 1 (reproduced by us on p. 329) and 6, where the finmembrane is not interrupted in the denticulated part of the dorsal.

1) See note on page 326.

teeth much larger, bladelike, alternating, but so crowded that they appear as a compressed serrate row. No scales. Gill-openings wide, low on the side, descending forward. Gillmem-

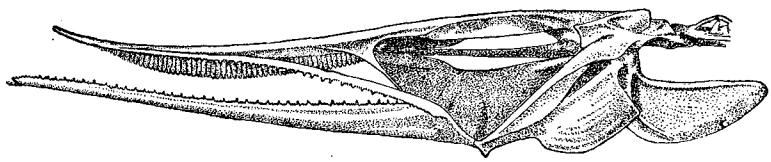

Fig. 160. *Serrivomer sector* Garm.
Skull, to show the dentition. (After GARMAN).

branes united, joined to a thin partion attaching them to the isthmus.

Distribution: Bathypelagic from 568 to 3240 M. Pacific, Indic and Atlantic.

1. Serrivomer sector Garman.

Serrivomer sector Garman, Reports on explorat. off the West Coast of Mexico XXVI. Fishes, Mem. Mus. Comp. Zool. Harvard Coll. XXIV. 1899, p. 320.
Serrivomer sector Brauer, Deutsche Tiefsee-Exp. Tiefseefische, I. 1906, p. 132.
Serrivomer sector Lloyd, Mem. Indian Mus. II. No. 3, 1909, p. 152.

D. 159—165; A. 161—160 (after GARMAN); P. 6—7; C. 6.

Height 5½; head 5.5—6; eye 18—20; snout 2.7 in head. Rays of dorsal shorter than those of anal. Pectorals very small, equal to eye. The distance of anus from vertical through pectoral is $^5/_6$ of the postorbital part of the head. Colour silvery with small black spots. Length 560 mm. [After BRAUER and GARMAN, not seen by us].

Habitat: Near West coast of Sumatra (1280 M. Valdivia Expedition). — Indic (1213—2400 M.); Pacific.

Note: GILBERT (Bull. U. S. Fish Comm. XXIII (1903) 1905, part II. p. 586), BRAUER (l. s. c.) and LLOYD (l. s. c.) suppose, that this species is identical with *Serrivomer beani* Gill & Ryder, (Proc. U. S. Nat. Mus. VI. (1883) 1884, p. 260). But *S. beani* has only 138 rays in the anal and its height is only 29.7 in the length according to GILL & RYDER. If this difference from *S. sector* is constant, we are of opinion that both species are valid. Otherwise the name *beani* has preference as being the older.

4. Avocettina Jordan & Davis.

(JORDAN & DAVIS, Report for 1888 U. S. Fish Comm. 1892, p. 655).

Exceedingly elongate, band-shaped, tail tapering into a point. Height of body in its anterior third much less than in its second third. Anus far behind pectorals. Origin of dorsal immediately behind the origin of the pectorals, that of anal immediately behind vent. Head nearly as deep as broad. Posterior

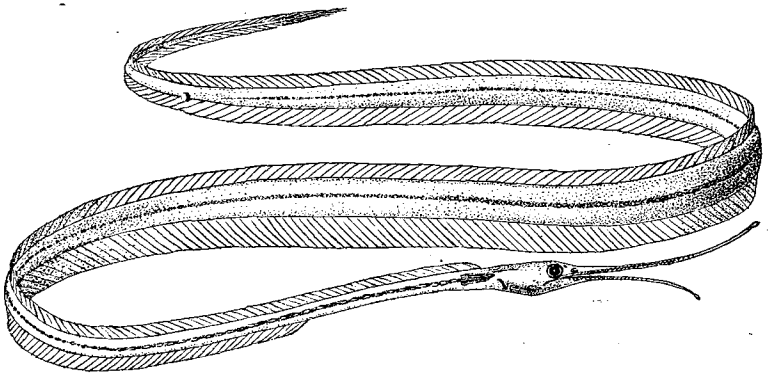

Fig. 161. *Avocettina infans* (Gthr). × 4/5.

nostrils near upper border of eye and close to anterior nostrils, which are tubulate. Eye moderate, without orbital margin. Snout produced into a long, slender bill, which is curved upwards [1]) and longer than the lower jaw, which is curved downwards [1]) and even as the snout at its top provided with a knoblike, denticulated intumescens. Teeth on jaws and vomer

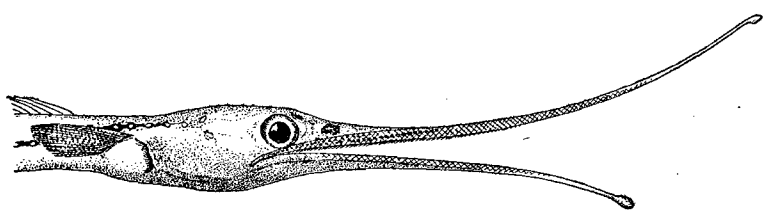

Fig. 162. *Avocettina infans* (Gthr.). × 2.

close set, with the point directed backward. Tongue not free. No scales; lateral line formed by one series of pores. Gill-openings rather wide, with a narrow interspace where the gillmembrane is fastened to isthmus.

Distribution: Bathypelagic (600—4573 M.). Atlantic, Indic and Pacific.

1) See note on page 326.

1. Avocettina infans (Gthr).

Nemichthys infans Günther, Ann. Mag. Nat. Hist. II. 1878, p. 252. — Challenger-Report Deepsea Fishes 1887, p. 264.
?*Labichthys elongatus* Gill & Ryder, Proc. U. S. Nat. Mus. VI. (1883) 1884, p. 262.
?*Labichthys Gilli* Bean, Proc. U. S. Nat. Mus. XIII. 1890, p. 45.
Avocettina infans Jordan & Davis, Report for 1888 U. S. fish Comm. 1892, p. 655.
Labichthys infans Goode & Bean, Oceanic Ichth. 1895, p. 153.
?*Avocettina elongata* Jordan & Evermann, Fishes North & Middle America III. 1898, p. 2802.
Avocettina infans Brauer, Deutsche Tiefsee-Exped. Tiefseefische 1906, p. 129.
Avocettina infans M. Weber, Siboga-Exp. Fische 1913, p. 53.

D. 325—353; A. 240—307; P. 14—15.

Height 40—48; head more or less than 9.5; snout 1.3—1.4 in length of head. Eye about 14, 2.3—2.6 times in postorbital part of head and twice or somewhat less than twice in interorbital space. Distance of origin of dorsal from base of pectorals less than twice the diameter of the eye. Postorbital part of head 3.6—4 times in distance of anal from base of pectorals; length of pectorals somewhat less or more than length of postorbital part of head. Dark brown, lateral pores in a blackish line. Length 600 mm.

Distribution: Flores Sea (1600 M. mud!); Molucco Passage (1994 M. coarse sand!); Halmahera Sea (827 M. hard bottom!); Banda Sea (2477 M. mud!); East coast of Sumatra (750 M.) — Atlantic: West Indies, Sierra Leone, Gulf of Guinea; Indic: Chagos Archipelago; East coast of Africa between Zanzibar and Aden.

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9. Fam. Synaphobranchidae.

Body elongate, compressed, covered by rudimentary scales, which are either lanceolate and placed at right angles or small and rounded and imbedded in the skin. Lateral line present. Anus far behind gillopenings, but before middle of length. Dorsal and anal confluent with caudal. Dorsal beginning close behind pectorals (*Histiobranchus*) or behind anus (*Synaphobranchus*), it is lower than anal. Pectorals present. Snout conical, pointed, jaws about equal. Cleft of mouth reaching far behind eye, closing completely. Nostrils large, the anterior in a short tube, the posterior an opening shortly before eye. Tongue not free; mucous membrane of mouth black. Teeth sharp, rather small,

in jaws in narrow bands, at the inner side with a series of larger teeth; in young specimens they are less numerous. On intermaxillary plate an oval patch of larger teeth, on vomer a long narrow band, tapering posteriorly. Gillopenings ventral,

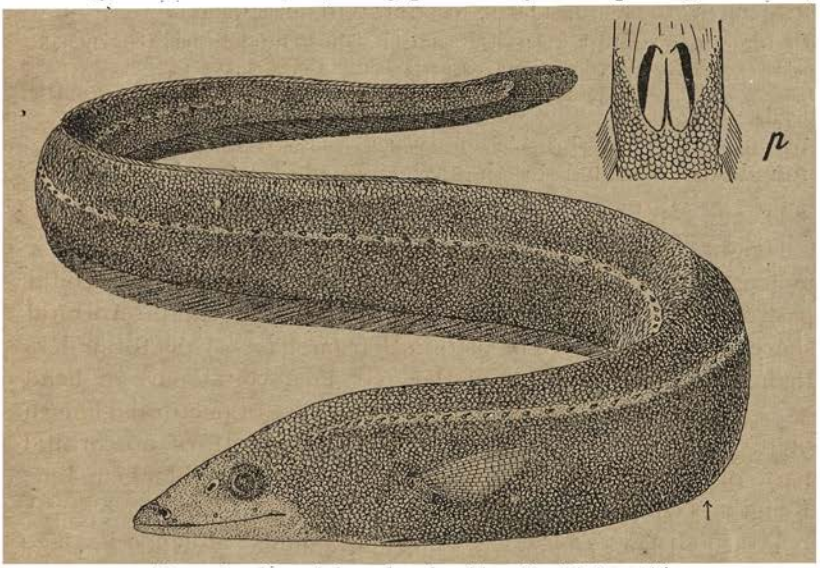

Fig. 163. *Synaphobranchus brevidorsalis* Gthr. × 2/5.
The small figure shows the united gillopenings at the ventral surface between the bases of the pectorals *p*. × 3/5.

united into an oval groove between the base of the pectorals, separated by a considerable isthmus within. Branchial openings in pharynx are wide slits.

Distribution: Deep sea, from 195—3749 M. depth.

1. Synaphobranchus Johnson.

(Johnson, Proc. Zool. Soc. London, 1862, p. 169).

Dorsal beginning behind anus; pectorals well developed, less than 3 times in length of head.

Distribution: Deep sea of Atlantic, Indic and Pacific.

1. Synaphobranchus brevidorsalis Gthr.

Synaphobranchus brevidorsalis Günther, Challenger Rep. Zool. XXII. 1887, p. 255.
Synaphobranchus jenkinsi Jordan & Snyder, Proc. U. S. Nat. Mus. XXIII. 1901, p. 845.
Synaphobranchus brevidorsalis Brauer, Deutsche TiefseeExp. Tiefsee-fische, 1906, p. 134.
Synaphobranchus brevidorsalis M. Weber, Siboga-Expeditie Fische, 1913, p. 55.

Height 11 to more than 22; head [measured to base of pectorals] 7.1—7.9; 1.2—1.6 in trunk. Head and trunk 2—2.3 in tail. Eye 6 to nearly 10, 1.8—2.3 in snout, situated nearer to corner of mouth than to tip of snout. Cleft of mouth 2—$2^1/_4$ in length of head. Origin of dorsal before or behind middle of length, situated at a distance behind anus equal to or one half longer than head. Its distance from head is more than two to nearly three lengths of head [2.3 to 2.8]. Length of pectorals 2.3 to 2.4 in length of head. Scales rudimentary, rounded, imbedded in the skin, extending to hindborder of eye. Dark brown. Length nearly 700 mm. [Description made after 3 specimens at our disposal].

Habitat: Ceram Sea: 1914 M. depth, mud!; Banda-or Celebes-Sea! (locality not quite sure); North of New Guinea: 1957 M. — Japan (Sagami Bay 631 M.); near coast of North East Africa 693 M.

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10. Fam. MORINGUIDAE.

Body scaleless, cylindrical. Anus far behind middle of length. Dorsal and anal confined to the tail, confluent with the caudal. Dorsal and anal rather low or reduced to a low fold, which

Fig. 164. *Moringua javanica* (Kaup). × $^2/_3$.

contains visible rays only at its end. Pectorals short, vistigial or absent. Snout rather short, the lower jaw may be prominent. Cleft of mouth reaching to below or behind hindborder of eye. Eye small or nearly hidden below skin. Posterior nostrils a subtubulate opening near the middle of the frontborder of the eye. Anterior nostrils in a tube near end of snout. Tongue

not free. Teeth pointed, conical, recurved, uniserial in the jaws and on the vomer. Gillopenings narrow, inferior or subinferior slits. Heart placed at some distance behind the gills. The first branchial opening in pharynx is wide, the following are narrow slits.

Living in salt and brackish water, buried in mud, sand or gravel; near shore, on reefs or in the mouth of rivers.

Distribution: Eastern part of the indo-pacific region, north to the Riu Kiu Islands, south to North Australia.

1. Moringua Gray.

(J. E. Gray, The Zoological Miscellany 1831, p. 9).

For characters and distribution of the single genus see those of the family.

Artificial key to the indo-australian species of Moringua.

A. Dorsal and anal, at least anteriorly and posteriorly, provided with visible rays, they are lower in the middle. (*Moringua* Bleeker).

I. Distance of anal from anus more than length of head. . . . . *M. bicolor* p. 338.

II. Distance of anal from anus somewhat more or much less than half length of head.

1. Distance of dorsal from anal more than half length of head. Pectorals vistigial . . . . . *M. microchir* p. 338.

2. Distance of dorsal from anal much less than half length of head.

a. Distance of anal from anus half or somewhat more than half length of head. Pectorals 5—7 times in head . . . . . *M. macrochir* p. 339.

b. Distance of anal from anus one fourth or less of length of head. Pectorals 4 to more than 5 times in head . . . . . *M. floresiana* p. 340.

B. Dorsal and anal fins reduced to a low fold, with a few feeble rays at the extreme tip of the tail only. (*Aphthalmichthys* Kaup).

1. Height 34—40; head 8.7—9.9 . . . . . *M. macrocephala* p. 341.

2. Height 40—58; head 6.1—8.1 . . . . . *M. abbreviata* p. 341.

3. Height 67—95; head 12—22 . . . . . *M. javanica* p. 342.

1. Moringua bicolor Kaup.

Moringua bicolor Kaup, Cat. Apod. fish 1856, p. 107.
Moringua bicolor Bleeker, Atl. Ichth. IV. 1864, p. 15.
Moringua bicolor Günther, Cat. Brit. Mus. VIII. 1870, p. 91. — Fische d. Südsee Heft IX. 1910. p. 405.

Height 60—70 (90 in a specimen of 775 mm.); head 12.5—16, 7.6 times in trunk (in a specimen of 346 mm.). Tail 2—$2^2/_3$ in length of head and trunk. Eye 11—14, much shorter than snout. Cleft of mouth about 5 times in length of head, reaching to hindborder of eye. Lower jaw in young and old specimens prominent. Dorsal and anal interrupted in their middle by an interspace about equal in length to that of their anterior part. The longest rays of this part are about equal to the height of the body. The distance of the origin of the anal from the

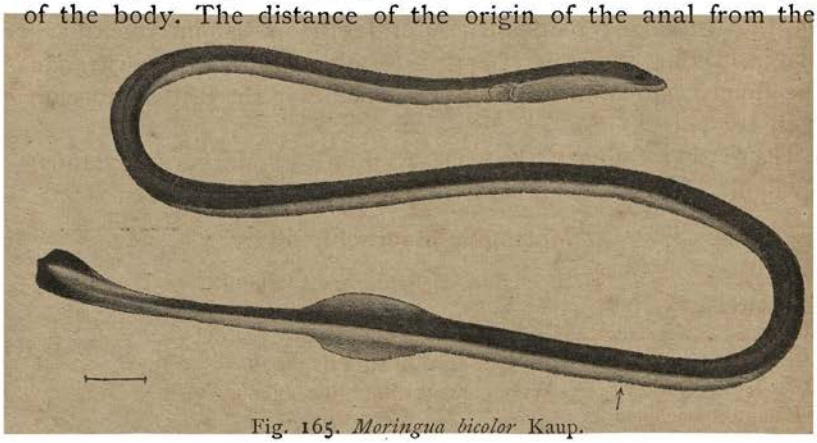

Fig. 165. *Moringua bicolor* Kaup.

anus is somewhat more than the length of the head. The origin of the dorsal is at a slight distance behind the vertical through the origin of the anal. Caudal forming a prominent point beyond the dorsal and anal with which it is confluent. Pectorals 6—$6^1/_2$ times in length of head, rounded. Teeth conical, pointed, uniserial, 6—8 in each mandible, 5—6 in each maxillary, 3 on the vomer and 3 pairs of stouter ones on the intermaxillary plate. Blackish brown above, yellowish white below, both colours sharply separated. Fins yellowish white, end of the united dorsal, caudal and anal blackish. Length to 775 mm.

Habitat: East Flores!; Timor. — Kandavu and New Britain!.

2. Moringua microchir Blkr.

Moringua microchir Bleeker, Nat. Tijdschr. Ned. Indië IV. 1853, p. 124. — Atl. Ichth. IV. 1864, p. 16.

Moringua lumbricoidea Günther, Cat. Brit. Mus. VIII. 1870, p. 91 (p. p.).
Moringua microchir Günther, Fische d. Südsee Heft IX. 1910, p. 405.

Height about 48; head $10^2/_3$—$12^1/_2$, $7^1/_2$ times in trunk. Tail about twice in length of head and trunk. Eye 12, about twice in snout. Cleft of mouth 4 times in length of head, reaching behind hindborder of eye. Lower jaw prominent. Dorsal and anal very low, only the anterior and posterior rays are visible. The distance of the origin of the anal from anus is $^1/_3$ of the length of the head. The origin of the dorsal is one length of head behind the vertical through the anus. The united caudal, dorsal and anal are obtusely rounded. Pectorals a very short but broad rudiment. Teeth conical, pointed, uniserial, about 10 in each mandible, about 6 in each maxillary, 5—6 on the vomer, 3 pairs of stouter teeth on the intermaxillary plate. Colour uniform. Length (of the known indo-australian specimens) 240 mm. [Type of the species in the British Museum seen by us].

Habitat: Sumatra (Kauer); Ambon!. — Marquesas Islands; Ovalau.

3. Moringua macrochir Blkr.

Moringua macrochir Bleeker, Nat. Tijdschr. Ned. Indië IX. 1855, p. 71. — Atl. Ichth. IV. 1864, p. 15.
? *Moringua macrochir* Kner, Novara-Fische 1865—1867, p. 389.
Moringua raitaborua Günther, Cat. Brit. Mus. VIII. 1870, p. 90 (p. p.).
Moringua raitaborua M. Weber, Siboga-Expeditie, Fische 1913, p. 52 (nec Hamilton Buchanan).

Height 37—44; head $9^2/_3$ to more than 11, 5.5 to 6.7 in trunk. Tail twice or somewhat more in length of head and trunk. Eye 9—12, shorter than snout. Cleft of mouth about 4 times in length of head, reaching to below posterior half of eye. Lower jaw prominent. Dorsal and anal rather low, interrupted in the middle by an interspace longer than the anterior part of the fins. The distance of the origin of the anal from the anus is about half or somewhat more than half the length of the head. The origin of the dorsal is somewhat behind

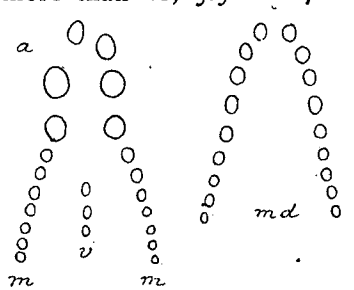

Fig. 166. Dentition of *Moringua macrochir* Blkr. *a* intermaxillary, *m* maxillary, *md* mandibulary, *v* vomerine teeth. × 9.

the vertical through the origin of the anal. The united caudal, dorsal and anal form a slightly subtruncate fin, the corners of which are rounded. Pectorals 5 to 7 times in length of head. Teeth conical, pointed, uniserial, 8 in each mandible, the 4 anterior stouter, 6—8 in each maxillary, 5—6 on the vomer, 3 pairs of stouter teeth on the intermaxillary plate. Colour uniform, back darker. Length 245 mm.

Habitat: Batu Islands; Java (Wijnkoops Bay!); Kei-Islands (Elat! reef).

4. **Moringua floresiana** n. sp.

Height 24—30; head 7.8—10, 4.3—5.7 in trunk. Tail about twice in head and trunk. Eye 8—10, somewhat shorter than snout. Cleft of mouth more or less than 4 times in length of head, reaching to hindborder of eye. Jaws nearly equal, upper jaw somewhat prominent. Dorsal and anal much lower in their middle, this lower part about equal in length to their anterior part, the longest rays of which are longer than half height of body. Origin of anal immediately behind anus, beginning with a ridge; in a ripe female the origin of the anal is one fourth of the length of the head behind the anus, and begins without a ridge. Origin of dorsal one fourth of the length of the head behind anus; in the ripe female more than one third of that length. United rays of caudal, dorsal and anal forming a spatulate fin. Pectorals 4 to more than 5 times in length of head. Teeth conical, pointed, uniserial; on the intermaxillary plate in a semioval series of 6—8 teeth, on the vomer in a longer or shorter series. Dark brown above, yellowish below, the two colours rather sharply defined. Anterior part of dorsal and the united caudal, dorsal and anal dark brown, their margin yellowish. Length 302 mm.

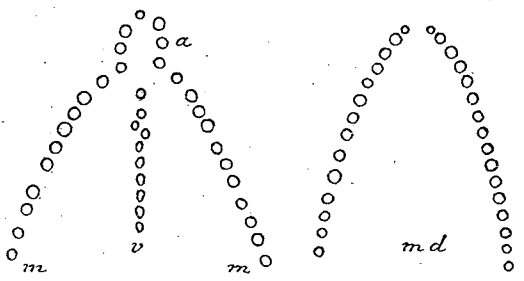

Fig. 167. Dentition of *Moringua floresiana* n. sp. *a* intermaxillary, *m* maxillary, *md* mandibulary, *v* vomerine teeth. × 8.

Habitat: South coast of Flores, on surface, not far from shore!, collected by Dr. G. A. J. VAN DER SANDE.

5. Moringua macrocephala (Blkr.)

Aphthalmichthys macrocephalus Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 165. — Atl. Ichth. IV. 1864, p. 17.
Moringua macrocephala Günther, Cat. Brit. Mus. VIII. 1870, p. 92.
Moringua macrocephala Day, Fish. India 4°. 1878—1888, p. 166.
? *Moringua abbreviata* Volz, Zool. Jahrb. System. XIX. 1903, p. 410 [1]).
Moringua macrocephala Jordan & Seale, U. S. Bull. Bureau fisheries XXV. (1905) 1906, p. 195.
Moringua (Aphthalmichthys) macrocephala Steindachner, Sitzb. Akad. Wien CXV. 1906, p. 1422.
Moringua macrocephala Günther, Fische d. Südsee Heft IX. 1910, p. 407.
Aphthalmichthys macrocephalus M. Weber, Fische Siboga-Exped. 1913, p. 52.

Height 34—40; head 8.7—9.9; 5.1—5.8 in trunk. Tail 1.7—2.3 in length of head and trunk. Eye very small, in a specimen of 378 mm. about 20 times in head. Cleft of mouth more or less than 6 times in head, reaching behind eye. Lower jaw prominent. The distance of the origin of the anal from anus about 2 to nearly 4 times in length of head. The origin of the dorsal opposite to or at some distance behind origin of anal. Dorsal and anal forming a very low ridge, somewhat increasing in height at their end, where they are united with the caudal, to form a short truncate fin. Pectorals rudimentary; they may be better developed in large specimens f. i. in a specimen of 378 mm. their length goes 15 times, in a specimen of 481 mm. 10 times in that of the head. Teeth conical, pointed, recurved, uniserial, the most anterior much stouter. Brown above, yellowish below. Length 700 mm.

Nom. indig.: Siwali (Simalur).

Habitat: Simalur!; Sumatra (river Banju asin in brackish water); Java (Dirk de Vries Bay!); Nusa laut!; Timor; New Guinea. — Philippines, Kanathea, Vitu, Samoa, British India.

Lives on or near shore, buried in mud.

6. Moringua abbreviata (Blkr.).

Aphthalmichthys abbreviatus Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 163. — Atl. Ichth. IV. 1864, p. 17.
Moringua abbreviata Günther, Cat. Brit. Mus. VIII. 1870, p. 92.
Moringua abbreviata Peters, Sitzb. Akad. Berlin 1877, p. 850.
Aphthalmichthys abbreviatus Jordan & Snyder, Proc. U. S. Nat. Mus. XXIII. 1901, p. 877.
Moringua abbreviata Volz, Revue suisse Zoologie XII. 1904, p. 482.

1) We are not sure about the identity of this fish, as the description contains an evident error about the length of the tail.

Moringua abbreviata Jordan & Seale, Proc. U. S. Nat. Mus. XXVIII. 1905. p. 773.
? *Aphthalmichthys intermedius* J. D. Ogilby, Proc. Roy. Soc. Queensland XX. (1906) 1907. p. 9.
Moringua abbreviata Günther, Fische d. Südsee, Heft IX. 1910, p. 406.
Aphthalmichthys abbreviatus M. Weber, Fische Siboga-Exped. 1913, p. 52.

Height 40—58; head 10.5 (when young)—13.3; 6.1—8.1 in trunk. Tail 2—2.6 in length of head and trunk. Eye minute, hidden below skin. Cleft of mouth 4.7—5.3 in length of head, reaching behind eye. Lower jaw prominent. The distance of the origin of the anal from anus goes $1^1/_3$ to 2 times in length of head. The distance of the origin of the dorsal from that of the anal goes 2—5 times in the length of the head. Teeth conical, pointed, recurved, uniserial, the upper anterior and those of the mandible stronger, fanglike. Brownish above, lighter below. Length 392 mm.

Nom. indig.: Ikan boulat (Upper Langkat, after Volz).

Habitat: Sumatra (Lake of river Wampu, Upper Langkat); Java (Prigi); Batu Island; Celebes (Menado); Sangir Islands; Island Serbete, North of Flores, reef!; Timor; Ambon, reef!; Ceram; Ternate; Island Saonek near Waigeu, reef!; Kei Islands!; Dutch North New Guinea on different localities at Humboldt Bay!. — Fidji Islands, Philippines, Riu Kiu Islands; (? North Australia after Ogilby).

Living near shore and on reefs in mud, sand and gravels; is also found in brackish water at the mouth of brooks and rivers.

7. **Moringua javanica** (Kaup). [Fig. 164, p. 336].

Aphthalmichthys javanicus Kaup, Cat. Apodal Fish, 1856, p. 105.
Aphthalmichthys javanicus Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 164. — Atl. Ichth. IV. 1864, p. 16.
Moringua javanica Günther, Cat. Brit. Mus. VIII. 1870, p. 92.
Moringua hawaiiensis Snyder, Bull. U. S. Fish. Comm. XXII. (1902) 1904, p. 517.
Moringua hawaiiensis Jordan & Evermann, Bull. U. S. Fish Comm. XXIII. (1903) 1905, p. 86.
Moringua javanica Günther, Fische der Südsee, Heft IX. 1910, p. 405.

Height 67—95; head 12 (in very young)—22; 7.5—13 in trunk. Tail 2—3.1 times in length of head and trunk. Eye minute, thickly covered by skin. Cleft of mouth 5—5.5 in length of head, reaching far behind eye. Lower jaw prominent. The distance of the anal from anus somewhat more or less than length of head. The origin of the dorsal somewhat before or behind or opposite to that of anal. Dorsal and anal a very

low ridge, slightly more elevated near small, pointed caudal, with which they are united. Pectorals absent or only rudimentary in very large specimens. Teeth conical, pointed, recurved, uniserial, the anterior stouter and fanglike. Pearl coloured, back darker. Length 950 mm.

Habitat: Java; Celebes (Menado); Ceram; Timor; Waigeu (Saonek Island!); Dutch North New Guinea (different localities at Humboldt Bay!). — Thursday Island!; Pacific Islands; Japan.

Lives on shore buried in sand, gravel and mud and prefers localities near mouth of rivers and brooks.

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11. Fam. MURAENIDAE.

Body scaleless, elongate or very elongate, rounded or more or less compressed. Anus far behind gillopenings, in, before or behind middle of length. Dorsal and anal confluent with caudal, generally covered by thick skin. They are well developed, very low or even reduced to a rudiment near the caudal, with which they are confluent. Pectorals absent. Snout short and rounded or pointed, never much projecting beyond lower jaw. Cleft of mouth reaching behind eye, generally considerably so, often not closing completely. Anterior nostrils in a tube near tip of snout. In the genus *Rhinomuraena* this tube ends as a foliaceous appendage. Posterior nostrils a rounded opening on top of head, before or above eye, sometimes provided with an elevated rim or a tube. Tongue not free. Teeth in one or more series in jaws, on intermaxillary plate and on vomer. They are granular, molarlike, conical or compressed and pointed, in the last case often fanglike and depressible. Gillopenings small, more or less horizontal slits or rounded openings, situated in the middle of the height of the body or nearer to the ventral or dorsal profile, but always widely separated from each other. Branchial openings in pharynx are narrow slits.

Distribution: Marine, on reefs and near shore of tropical and temperate seas.

Key to the indo-australian genera of Muraenidae.

I. At least some of the teeth granular or molarlike. . *Echidna* p. 344.

II. None of the teeth granular or molarlike.

A. Head and trunk $1^1/_2$ to more than twice in tail.
  a. Tubes of anterior nostrils with a foliaceous appendage. Tip of snout and of lower jaw with barbel-like appendages . . . . . *Rhinomuraena* p. 352.
  b. Anterior nostrils in a simple tube. No barbel-like appendages . . . . . *Thyrsoidea* p. 354.
B. Head and body equal to, somewhat shorter or longer than tail.
  a. Dorsal and anal reduced to rudiments near caudal, with which they are confluent . . . . *Gymnomuraena* p. 392.
  b. Vertical fins not reduced to rudiments: dorsal beginning before gillopenings, anal immediately behind anus . . . . . *Muraena* p. 356.

1. Echidna J. R. Forster.

(J. R. Forster, Enchiridion hist. nat. 1788, p. 81).

Elongate, compressed. Head compressed, its dorsal profile strongly arched. Eye small, covered by skin. Anterior nostrils in a tube on top of snout, posterior nostrils on upper surface of head before or above eye. Cleft of mouth rather wide,

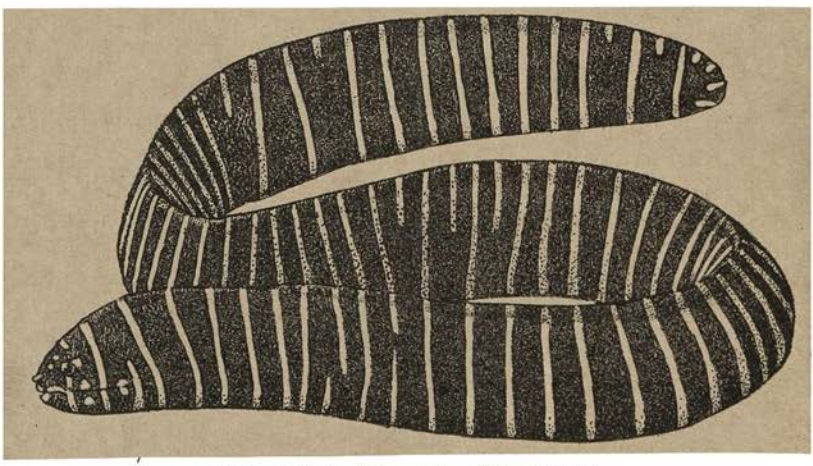

Fig. 168. *Echidna zebra* (Shaw.) × $^3/_5$.

reaching behind eye. Pectorals absent. Dorsal beginning before, above or somewhat behind gillopenings, confluent with caudal and anal. Dorsal and anal covered by thick skin. Tail equal to or somewhat longer or much shorter than head and trunk. Teeth conical, granular or molarlike, often changing with age

in form as well as in their number and arrangement. In jaws in one or more series. On vomer in one to three series or in a group; on intermaxillary plate in a semicircle, enclosing a few larger central ones, or in a group. Gillopenings small, horizontal, situated in the middle of the height of the body.

Distribution: Reefs and shores of tropical seas.

Artificial key to the indo-australian species of Echidna.

A. Tail twice or more than twice in head and trunk. Roundish group on intermaxillary plate and pear-shaped group of vomerine teeth continuous. Blackish brown with 30 to more than 100 narrow white rings. *E. zebra* p. 345.

B. Tail equal to, 1/3 longer or somewhat shorter than head and trunk.

I. 24—29 narrow rings, exceptionally on tail only. When young, teeth on intermaxillary plate in a peripheral series enclosing 3 larger mesial ones, on the vomer in 2 series; when old, on intermaxillary plate and on vomer in a group . . . . . *E. polyzona* p. 346.

II. Spotted. Origin of dorsal before gillopenings. Teeth on intermaxillary plate in a semicircle with 1 or 2 central ones. Tail somewhat shorter than head and trunk.

1. Brown with numerous round or oval patches. Head less than thrice in trunk. . . . . *E. xanthospilus* p. 348.
2. Numerous small spots or lines and 2 series of large, more or less star-like patches. Head 3 1/2 to more than 4 times in trunk. . . . . *E. nebulosa* p. 348.

III. Uniform with white spot near corner of mouth. Origin of dorsal above or behind gillopenings. . . *E. rhodochilus* p. 350.

IV. Marbled or mottled with darker. Origin of dorsal before gillopenings.

1. Origin of dorsal far before gillopenings. Teeth on intermaxillary plate in a semicircle, enclosing 2 strong teeth in middle; on vomer in 2 series. *E. delicatula* p. 350.
2. Origin of dorsal shortly before gillopenings. Teeth on intermaxillary plate in a group; on vomer in a single series . . . . . *E. amblyodon* p. 351.

1. **Echidna zebra** (Shaw). [Fig. 168, p. 344].

Gymnothorax zebra Shaw, Natural. Miscell. IX. 1797, pl. 322.
Gymnothorax zebra Bloch, Schneider, Syst. Ichth. 1801, p. 528.

Gymnomuraena doliata Lacépède, Hist. nat. Poissons V. 1803, p. 648, 649.
Muraena molendinaris Bennett, Proc. Zool. Soc. London, I. 1833, p. 32.
Gymnomuraena zebra Richardson, Voy. Erebus & Terror, Fishes 1844, p. 95.
Gymnomuraena fasciata Kaup, Cat. Apod. fish 1856, p. 103.
Gymnomuraena zebra Kaup, l. c. p. 104.
Muraena zebra Bleeker, Nat. Tijdschr. Ned. Indië XIII. 1857, p. 80.
Echidna zebra Bleeker, Atl. Ichth. IV. 1864, p. 81.
Muraena zebra Günther, Cat. Brit. Mus. VIII. 1870, p. 128.
Muraena zebra Klunzinger, Verh. zool. bot. Ges. Wien XXI. 1871, p. 620.
Muraena zebra Day, Fish. India 4°. 1878—1888, p. 673.
Echidna zebra Jordan & Evermann, Bull. U. S. fish. Comm. XXIII (1903) 1905, p. 106.
Muraena zebra Günther, Fische d. Südsee, Heft IX. 1910, p. 422.

Height 17—21; head 8.6—9.75, 4.8 to about 5.5 in trunk. Tail nearly twice to more than twice in head and trunk. Eye 10—12.5, 1.6 to twice in snout. Snout more or less than 7 in head. Cleft of mouth 2.7 to 3.5 in length of head, reaching far behind eye. Dorsal beginning behind gillopenings, its height about 4 times in height of body; not very distinct under the thick skin. Teeth granular, the maxillary ones the smallest, in two short series. Mandibulary teeth in 3 to 4 irregular series, the inner series the largest. On the vomer a pear-shaped group of large teeth, broadly connected with the roundish group of similar teeth on the intermaxillary plate; the central teeth in both groups the largest. Alcohol specimens blackish brown, encircled by 30 to more than 100 white, black-edged narrow rings. Some of the rings may be incomplete, they are less regular the more numerous they are. Length 1250 mm.

Habitat: Sumatra; Banda!; Buru; Ambon; Waigeu; Flores!; Timor. — From the Red Sea, East coast of Africa, Madagascar, Mauritius, to the Pacific Islands (Samao) and Philippines.

On reefs and near shore.

2. Echidna polyzona (Rich.).

?*Muraena helena* Linné, Syst. nat. edit. X^a, 1758, p. 244 (according to Lönnberg, Bihang Svenska Akad. XXII. N°. 1, 1896, p. 24).
Muraena polyzona Richardson, Voyage Sulphur, Fishes, 1844, p. 112. — Voyage Erebus & Terror, Fishes, 1844, p. 95.
Muraena polyzona Bleeker, Act. Soc. Sc. Indo-neerl. I. 1856, Vissch. van Menado p. 73.
Poecilophis polyzonus Kaup, Cat. Apod. fish 1856, p. 101.
Muraena dizona Bleeker, Nat. Tijdschr. Ned. Indië XXII. 1860, p. 260.
Echidna polyzona Bleeker, Atl. Ichth. IV. 1864, p. 81.
Poecilophis polyzona Kner, Fische d. Novara 1865—1867, p. 382.
Muraena polyzona Günther, Cat. Brit. Mus. VIII. 1870, p. 129.

Muraena polyzona Klunzinger, Verh. zool. bot. Ges. Wien XXI. 1871, p. 617.
Echidna tritor Vaillant & Sauvage, Revue & Mag. Zool. 1875, p. 287.
Muraena polyzona Day, Fishes of India 4°. 1878—1888, p. 673.
Echidna zonata Fowler, Proc. Acad. Nat. Sc. Philadelphia 1900, p. 495.
Muraena polyzona Steindachner, Abh. Senckenb. nat. Ges. XXV. 1901, p. 457.
Echidna zonophaca Jordan & Evermann, Bull. U. S. Fish. Comm. XXII. (1902) 1904, p. 167.
Echidna leihala Jenkins, Ibid. p. 428.
Echidna vincta Jenkins, Ibid. p. 429.
Echidna obscura Jenkins, Ibid. p. 430.
Echidna psalion Jenkins, Ibid. p. 431.
Echidna psalion, *obscura*, *zonata*, *zonophaca*, *leihala*, Jordan & Evermann, Ibid. XXIII. (1903) 1905, p. 106—109.
Echidna tritor Jordan & Snyder, Ibid. XXVI. (1906) 1907, p. 208.
Muraena polyzona Günther, Fische d. Südsee, Heft IX. 1910, p. 422.
Echidna tritor Kendall & Goldsborough, Mem. Mus. Comp. Zool. Harvard Coll. XXVI. 1911, p. 248.
Echidna sauvagei Fowler, Proc. Acad. Nat. Sc. Philadelphia LXIV. 1912, p. 30.

Height 15—18; head 7—7.4, 2.2—2.7 in trunk; head and trunk somewhat longer or shorter than tail. Eye 8—10, somewhat less than half length of snout. Snout 5.5—6 in head; cleft of mouth more or less than thrice in length of head, reaching behind eye. Dorsal beginning before gillopenings, its height much less than half height of body. Maxillary teeth conical, in two series, much smaller than the vomerine teeth. On the intermaxillary plate obtusely conical, when young in an outer series enclosing a mesial series of 3 larger teeth, in old specimens more molarlike and in an irregular group; on the vomer stout and granular, in young specimens in 2 series, increasing later on in number and forming a pear-shaped group reaching much farther than the maxillary teeth and composed posteriorly of about 5 series. Mandibulary teeth in 2 series, increasing in old specimens posteriorly into 3 series, the outer series conspicuously smaller. Mostly dark brown with 24—29 narrow white rings, produced on fins, or whitish with brown rings according to prevalent colour. The rings may be interrupted or may nearly vanish, except on the end of the tail,

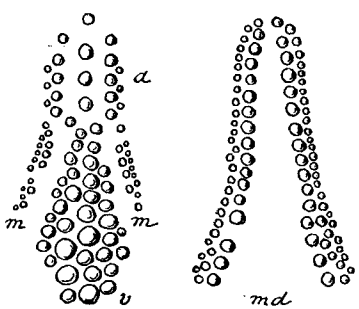

Fig. 169. Dentition of *Echidna polyzona* (Rich.). *a* intermaxillary, *m* maxillary, *md* mandibulary, *v* vomerine teeth. × 3.

in which case the colour is reticulated or marbled. Generally a dark patch at corner of mouth. Length to 550 mm. [A specimen of BLEEKER's collection seen by us].

Habitat: Java; Celebes; Ambon!; Ternate; Buru; Ceram; Waigeu!; Rotti!; Timor; Cocos Island. — From Red Sea to Pacific Islands, Formosa and the Riu Kiu Islands.

On reefs and near shore.

3. **Echidna xanthospilus** (Blkr.).

Muraena xanthospilos Bleeker, Nat. Tijdschr. Ned. Indië XIX. 1859, p. 348.
Poecilophis ornata Kaup, Aalähnl. Fische, Hamburg 1859, p. 28.
Echidna xanthospilus Bleeker, Atl. Ichth. IV. 1864, p. 79.
Muraena xanthospila Günther, Cat. Brit. Mus. VIII. 1870, p. 131. — Fische d. Südsee, Heft IX. 1910, p. 423.

Height 13.5—14.5; head 7—7.6, 2.6—2.7 in trunk. Tail more or less than 1.2 in head and trunk. Eye 10—15, twice or thrice in length of snout. Snout 6—7 times in length of head. Cleft of mouth 2.6 to 3.7 times in head, reaching far behind eye. Dorsal begins in advance of the gillopenings, its height rather low. Teeth obtuse, granular; in the maxillaries in one series, when young in an outer series of about 10 and in an shorter inner series of 2—5. Mandibulary teeth in 2—3 series, the anterior inner teeth much stouter but conical. On the vomer anteriorly in 3, posteriorly in 2 irregular series; on the intermaxillary plate a horseshoe-shaped series of large conical teeth, with a few central ones. In alcohol lighter or darker brown with numerous yellowish round or oval patches and irregular streaks, much larger than the eye, especially on the lower surface. Length 750 mm. [A specimen of BLEEKER's collection in the Leiden Museum seen by us].

Habitat: Java; East Indies (Kaup). — Samoa.

4. **Echidna nebulosa** (Ahl).

Muraena nebulosa Ahl, Dissert. de Muraena et Ophichtho 1789, p. 5.
Gymnothorax echidna Bloch, Schneider, Syst. Ichth. 1801, p. 526.
Gymnothorax nebulosus Bloch, Schneider, l. c. p. 528.
Muraena ophis Rüppell, Atl. Reise Nördl. Afrika, Fische, 1828, p. 116.
Echidna variegata J. R. Forster, Descr. anim. ed. Lichtenstein 1844, p. 181.
Thaerodontis ophis Mc Clelland, Calcutta Journ. Nat. hist. V. 1844, p. 217.
Muraena variegata Richardson, Voy. Erebus & Terror, Fish. 1844, p. 94.
Muraena variegata Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 295. — Verh. Batav. Gen. XXV. 1852, Muraenoid. p. 47.

Poecilophis variegata Kaup, Cat. Apodal fish 1856, p. 98.
Echidna variegata Bleeker, Atl. Ichth. IV. 1864, p. 80.
Poecilophis variegata Kner, Fische d. Novara 1865—1867, p. 381.
Muraena nebulosa Günther, Cat. Brit. Mus. VIII. 1870, p. 130.
Muraena nebulosa Klunzinger, Verh. Zool. bot. Ges. Wien XXI. 1871, p. 618.
Muraena nebulosa Day, Fish. India 4°. 1878—1888, p. 673.
Echidna nebulosa Jordan & Evermann, Bull. U. S. fish Comm. XXIII. (1903) 1905, p. 110.
Muraena nebulosa Günther, Fische d. Südsee, Heft IX. 1910, p. 423.

Height 16—21; head 9—10, 3.5 to more than 4 in trunk. Tail somewhat shorter than head and trunk. Eye 9.5—12.5, more or less than twice in snout. Snout 5.5 to nearly 6 times in length of head. Cleft of mouth 3—3.5 in head, reaching behind eye. Dorsal beginning before gillopenings, its height about 4 times in height of body. Teeth in the upper jaw uniserial, small, bluntly conical, in young specimens pointed, recurved and with a short inner series of 3 to 4 teeth. On the intermaxillary plate two large granular mesial teeth, inside of a hemicircle of 10—12 similar but somewhat smaller teeth. On vomer 2 parallel series of about 6—10 teeth of different size, mostly granular; in young specimens each series is anteriorly curved outwards and reaches the border of the upper jaw. Teeth in the lower jaw of old specimens in two series, in younger ones only anteriorly so; those in the inner row larger. Yellowish or whitish with numerous fine vermiculated lines or small spots, and two series of large, reticulated black spots, one series along the back and a lower one along the lower half of the body. They include one or more white spots and may be reduced to star-like figures. A more or less regular series of black bands may connect the large black spots on each side of the lower half of the body. Length about 750 mm.

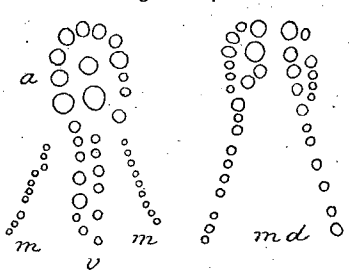

Fig. 170. Dentition of *Echidna nebulosa*. *a* intermaxillary, *m* maxillary, *md* mandibulary, *v* vomerine teeth. × 5.

Nom. indig.: Bīnĭr (District Tapah, Island Simalur).

Habitat: Sumatra (Benkulen, West coast Atjeh); Simalur Island!; Cocos Island; Java (Prigi, Karangbollong, Patjitan and Penandjung Bay on south coast!); Celebes (Menado, Tombariri); Muaras reef!; Sanguisiapo, Sulu Islands!; Karakelang

Islands (Beo!); Sula Besi!; Buru; Ambon!; Ceram; Goram; Ternate; Waigeu (Saonek!); New Guinea; Schouten Island (Mysore); Aru (Dobo!); Timor; Island Samau!; Solor; Flores!; Sumba (North! and South coast!). — From Red Sea, East coast of Africa, Madagascar to Australia, Pacific Islands, Philippines and China.

On reefs and near shore.

5. **Echidna rhodochilus** Blkr.

Echidna rhodochilus Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 247. — Atl. Ichth. IV. 1864, p. 79.
Muraena rhodochilus Günther, Cat. Brit. Mus. VIII. 1870, p. 132.
Echidna rhodochilus Max Weber, Siboga-Exped. Fische 1913, p. 61.

Height 18—19; head 8—10, 3—3.6 in trunk. Head and trunk equal to or somewhat shorter than tail. Eye 8—10, shorter than snout. Snout about 6.5 in length of head. Cleft of mouth more than 3 to 3.5 in length of head, reaching far behind eye. Origin of dorsal above or slightly behind gillopenings, fleshy, its height about thrice the height of the body. Teeth obtusely conical, in the maxillaries in 2 series, the outer with about 14, the inner with 8—10 teeth, in the lower jaw posteriorly a series of about 10—12 teeth, anteriorly two series of 5—7 pairs of teeth, the inner of which are stouter. On the vomer one regular series or two incomplete or complete irregular series of stronger teeth; on the intermaxillary plate a broad, nearly oval group of teeth, in the outer series much smaller than the 11—13 much stouter inner ones. Spirit specimens dark reddish brown (after BLEEKER finely marbled with darker), a white spot on upper and lower lip near corner of mouth. Length 338 mm.

Nom. indig.: Utoi (Island Simalur, district Tapah).

Habitat: Island Simalur (Sinabang Bay!, Lugu!); Buru; Rotti; Karakelang Island (Beo)!.

6. **Echidna delicatula** (Kaup).

Poecilophis delicatulus Kaup, Cat. Apod. fish 1856, p. 102.
Echidna delicatula Bleeker, Atl. Ichth. IV. 1864, p. 78.
Muraena amblyodon Günther, Cat. Brit. Mus. VIII. 1870, p. 132 (p. p.).
Echidna Kishinouyei Jordan & Snyder, Proc. U. S. Nat. Mus. XXIII. 1901, p. 885.
Echidna delicatula Jordan & Seale, Ibid. XXVIII. 1905, p. 772. — Bull. Bureau fisheries XXV. (1905) 1906, p. 204.
Muraena amblyodon Günther, Fische d. Südsee, Heft IX. 1910, p. 424.

Echidna delicatula de Beaufort, Bijdrage Dierkunde Amsterdam, afl. XIX. 1913, p. 100.

Height 14—17; head 7.4 to more than 9, 2.8 in trunk. Head and trunk more than once to 1.5 in tail. Eye about 10, much shorter than snout. Snout 6 to more than 6.5 in head. Cleft of mouth more or less than 3 times in length of head. Dorsal beginning far before gillopenings, immediately behind occiput, rather high, 2.5 to about thrice in height of body. Anal lower, but conspicuous. Teeth conical; in the maxillaries in 2 series, the inner one shorter. On the intermaxillary plate a prolonged semicircle of about 9—13 strong teeth, separated from the maxillary teeth; besides 2 strong teeth in the middle, separated from the teeth on the vomer. These form 2 series beginning with 2 pairs of stronger teeth and ending far before the maxillary series. Maxillary teeth in 2 series or only anteriorly in 2 series; the inner teeth the strongest. Colour light brown or whitish, everywhere marbled or mottled with darker, or dark brown marbled with whitish. The head may be largely dark brown behind the eye. Length 440 mm. [Type of the species of KAUP and a specimen of BLEEKER's collection in the Leiden Museum seen by us].

Habitat: Ambon; Buru; Saonek near Waigeu!; Timor. — Philippines, Japan, Riu Kiu Islands, Samoa.

On reefs and near shore.

7. Echidna amblyodon (Blkr.).

Muraena amblyodon Bleeker, Act. Soc. Sc. Indo-neerl. I. 1856, Vissch. van Menado p. 72.

Echidna amblyodon Bleeker, Atl. Ichth. IV. 1864, p. 79.

Muraena amblyodon Günther, Cat. Brit. Mus. VIII. 1870, p. 132 (p.p.). — Fische d. Südsee, Heft IX. 1910, p. 424 (p.p.).

Height 10—13; head 7—7.5, about 2.6 in trunk. Tail slightly shorter than head and trunk. Eye 6.5—8, somewhat shorter than snout. Snout about 5.5 times in length of head. Cleft of mouth 2.5—2.8 in length of head, reaching behind eye. Dorsal beginning shortly before gillopenings, rather low, covered by thick skin. Teeth conical; in the maxillaries in 2 series; in the inner series about 6—7 teeth, somewhat stronger than those in the outer series, which are continued as outer series of the teeth of the intermaxillary plate. Inside of them the plate carries 3 longitudinal series of strong teeth.

The teeth of the inner series are prolonged on the vomer, where they form a single series of somewhat smaller teeth, reaching behind the maxillary teeth. Mandibulary teeth anteriorly in 2, posteriorly in one series, the inner ones the longest. Nearly uniform brown, densely marbled with darker. Length 205 mm. [Specimen of BLEEKER's collection of 120 mm. length seen in the Leiden Museum; the above description [1]) of the dentition is made after this specimen].

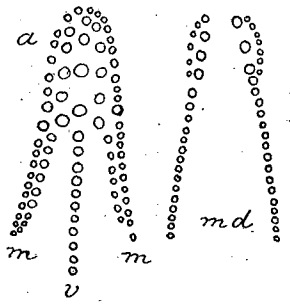

Fig. 171. Dentition of *Echidna amblyodon* (Blkr.) *a* intermaxillary, *m* maxillary, *md* mandibulary, *v* vomerine teeth. × 7.

Habitat: Bawean Island; Celebes (Menado); Ambon; Batjan; Buru; Timor. — Marquesas Islands [Seale]; Samoa [British Museum].

2. **Rhinomuraena** Garman.

(GARMAN, Bull. Essex Inst. (1888) 1889, p. 114).

Very slender and elongate, somewhat compressed. Head compressed; the pointed snout at its apex with a barbel-like filamentous appendage and 3 similar ones on the symphysis of the lower jaw. Eye small, covered by skin. Anterior nostrils produced into tubes ending with a foliaceous appendage, the margin of which is slit; posterior nostrils a rounded opening shortly before eye in the level of its upper border. Cleft of mouth reaching far behind eye, closing completely. Pectorals absent. Dorsal, anal and caudal confluent, well developed, covered by thin skin only. Origin of dorsal on top of head far before gillopenings. Tail extremely elongate, more than twice longer than head and body. All teeth uniserial, conical, pointed. The series of maxillary teeth is continued on the intermaxillary plate, which carries besides mesially 3 depressible and somewhat longer teeth. Gillopenings larger than eye, situated in lower half of height, forming a kind of a tube.

Distribution: Only 2 species are known, *Rh. quaesita*

1) This description is not in accordance with that of BLEEKER, who says, that in the maxillary the teeth are in 3 series and on the vomer anteriorly in 2 and posteriorly in one series. His figure gives clear representation of this statement.

Garm. from the Marshall Group and *Rh. ambonensis* Barbour from Ambon and Banda.

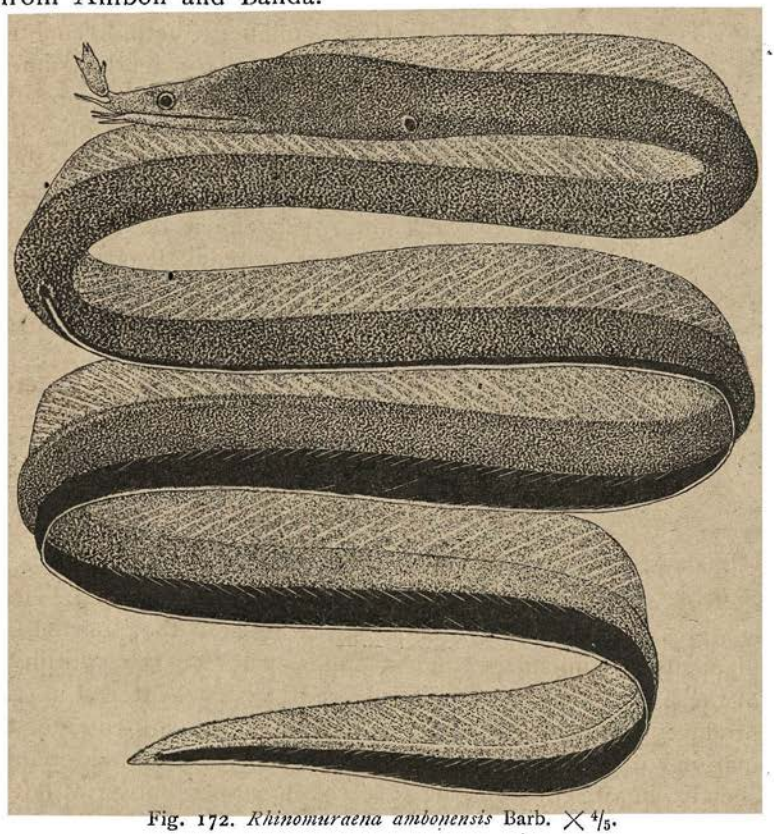

Fig. 172. *Rhinomuraena ambonensis* Barb. × 4/5.

1. Rhinomuraena ambonensis Barb.

Rhinomuraena ambonensis Barbour, Proc. Biol. Soc. Washington XXI. 1908, p. 40.

Height 71—76; head 19—21, 4.7—5.2 in trunk. Head and trunk about 2.3 in tail. Eye small, nearer to corner of mouth than to tip of snout, which goes more than 6 times in length of head. Cleft of mouth 2.5 times in length of head. Dorsal increasing in height posteriorly, in middle of tail much higher than body underneath. Anal increasing in height posteriorly, in posterior part of tail equalling the height of the tail. Colour anteriorly bright blue, becoming lavender colour on the tail. Anal deep black with a white margin. Dorsal, snout with anterior

nostrils, lower jaw, gillopenings cream coloured. Length more than 1000 mm.

Habitat: Ambon; Banda!. On coral reefs.

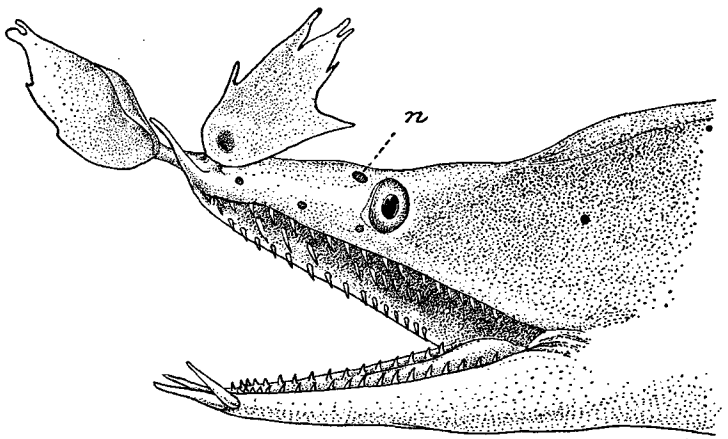

Fig. 173. *Rhinomuraena ambonensis* Barb.
n posterior nostril; the barbel-like prolonged point of the snout between the anterior nostrils, which are in tubes with a foliaceous appendage.

3. Thyrsoidea (Kaup p.p.) Bleeker [1]).

(Bleeker, Atl. Ichth. IV. 1864, p. 110).

Evenchelys Jordan & Evermann.
Rhabdura Ogilby.

Exceedingly elongate, slender and slightly compressed. Eye small, covered by skin. Anterior nostrils tubular, situated on the top of the snout, posterior nostrils on top of head above frontborder of eye, their margin provided with a rim. Cleft of mouth closing nearly completely, wide, reaching far behind eye, the eye being situated much nearer to tip of snout than to corner of mouth. Pectorals absent. Dorsal and anal confluent with caudal, covered by thick skin, the dorsal beginning far before gillopenings, which are small, oblique slits, their margins prominent. Tail much longer than head and body. Teeth acute, compressed, in the maxillaries biserial, in the mandibles uniserial, near the symphysis in 2 series; on vomer

1) The reason for following Bleeker in using the name *Thyrsoidea* Kaup (Cat. Apod. fish 1856, p. 73) for this genus is based on "Rules of Zool. Nomenclature adopted by the V. Intern. Congress of Zoology 1901, V. § 2".

a single row of smaller ones, on the intermaxillary plate a peripheral series and a mesial row of about 4 depressible teeth.

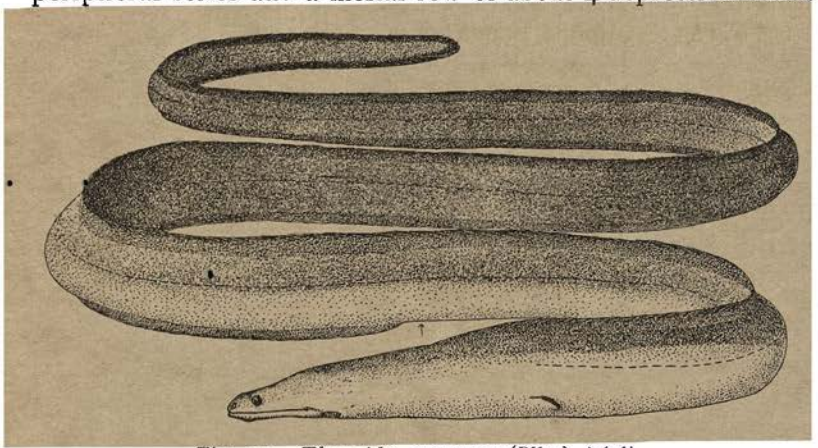

Fig. 174. *Thyrsoidea macrurus* (Blkr.). × 1/6.

Distribution: That of the single species known.

1. Thyrsoidea macrurus (Blkr.).

Muraenä macrurus Bleeker, Nat. Tijdschr. Ned. Indië VII. 1854, p. 324.
Thyrsoidea longissima Kaup, Cat. Apodal Fish 1856, p. 82.
Thyrsoidea macrurus Bleeker, Atl. Ichth. IV. 1864, p. 111.
Thyrsoidea macrurus Kner, Fische Novara-Exped., 1865—67. p. 386.
Muraena macrurus Günther, Cat. Brit. Mus. VIII. 1870, p. 127.
Muraena macrura Day, Fish. India 4°. 1878—88, p. 672.
Muraena macrurus Perugia, Ann. Mus. Civ. Genova XIII. (XXXIII). 1893, p. 255.
Evenchelys macrurus Jordan & Evermann, Proc. U. S. Nat. Mus. XXV. 1902, p. 327.
Rhabdura macrura Douglas Ogilby, Proc. Royal Soc. Queensland XX. 1906, p. 13.
Muraena macrurus Max Weber, Nova Guinea V. Livr. 2, 1908, p. 227.
Muraena macrurus Günther, Fische d. Südsee, Heft IX. 1910, p. 421.
Evenchelys macrurus Fowler, Proc. Acad. Nat. Science Philad. LXIV. 1912, p. 20.
Rhabdura macrura Max Weber, Siboga-Expeditie, Fische 1913, p. 56.

Height 38—47, head 10—14, 3—4 in trunk. Head and trunk 1.5—2 in tail. Eye 20—27, more than twice in snout. Gill-openings wider than eye. Gape of mouth 2.6—3.4 in head. Maxillaries with 16—20 teeth in the outer row and about 10 longer teeth in the inner row. Peripheral series on intermaxillary plate consisting of about 14 teeth, which are irregularly placed; some of them are much smaller than the others; mesially 3 or 4 large depressible fangs. Vomer with a single series of 8 or 9 small teeth. In the mandibles on each side an outer series of 20—24 nearly equal teeth, anteriorly with

an inner row of 4—7 larger ones. Grayish brown, lighter below. Length more than 3000 mm.

Nom. indig.: Pampan or Pompa (Bantam, Java).

Habitat: Sumatra (Padang); Island Engano; Java (Anjer, Batavia); Flores!; New Guinea (mouth of Merauke river!). — Natal, British India, Ceylon, Andamans, Formosa, Palew Islands, Queensland (Pine River).

This eel is probably the largest apodal fish in existence, it lives in shallow water of the seas but frequents also the mouth of rivers and even ascends rivers.

4. **Muraena** Linné.

(Linné, Systema nat. edit. X^a, 1758, p. 244).

Elongate or very elongate, compressed. Head compressed. Eye small, covered by skin. Anterior nostrils in a short tube on top of snout, posterior nostrils a round or oval opening on the top of the head before eye, sometimes provided with a rim, or with a conspicuous tube. Cleft of mouth reaching behind eye, often not closing completely. Pectorals absent. Origin of

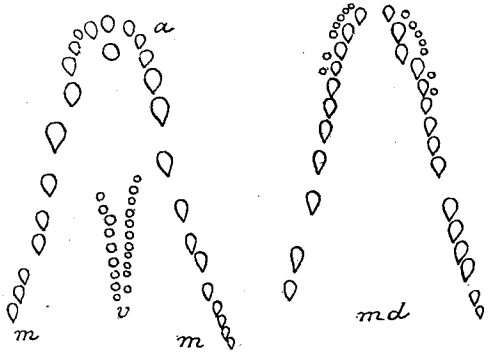

Fig. 175.
Dentition of *Muraena (Gymnothorax) picta* Ahl. *a* intermaxillary, *m* maxillary, *md* mandibulary, *v* vomerine teeth. × 5/4.

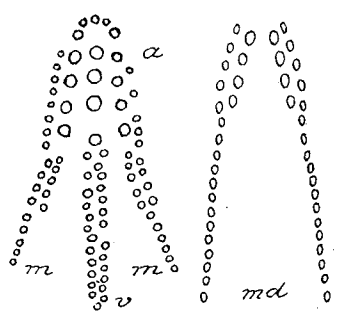

Fig. 176. Dentition of *Muraena (Gymnothorax) tile* (Ham. Buch.). *a* intermaxillary, *m* maxillary, *md* mandibulary, *v* vomerine teeth. × 3 1/2.

dorsal (in Indian species) before gillopenings, which are small, more or less horizontal slits. Dorsal and anal confluent with caudal, covered by thick skin. Tail shorter or somewhat longer than body. Teeth in the jaws in one or more series, on intermaxillary plate generally in one or two peripheral rows and 1—3 mesial teeth. Teeth on vomer generally smaller than the others, in one or more rows. Teeth conical, or compressed.

Some of them are often long, depressible fangs. In the subgenus *Priodonophis* the compressed teeth have serrated edges on both sides or posteriorly only.

Distribution: Warm water of Indic, Pacific, Atlantic and Mediterranean; in shallow water, especially on reefs and in crevices of rocks, some of them reaching a large size.

Synopsis of the indo-australian Subgenera of Muraena.

I. Posterior nostrils in a tube, longer than the simple tubes of the anterior nostrils . . . . Subgenus *Muraena* p. 357.

II. Posterior nostrils without tube, or with a tube much shorter than the simple tubes of the anterior nostrils.

1. Height 40—51; head 12—17; none of the teeth serrated . . . . . Subgenus *Strophidon* p. 359.

2. Height less than 30; head less than 12; none of the teeth serrated . . . . . Subgenus *Gymnothorax* p. 360.

3. Height less than 30; head less than 9. At least some of the teeth in upper and lower jaw finely serrated on both edges or posteriorly only. . . . . Subgenus *Priodonophis* p. 387.

III. Anterior nostrils with a thickened rim, posteriorly prolonged in a bilobed flap; posterior nostrils an oval opening, nearly equalling the eye, surrounded by a broad, thin membrane . . . . . Subgenus *Enchelynassa* p. 390.

1. Subgenus **Muraena** Linné (s.str.).

(Linné, Systema nat. edit. X^a. 1758, p. 244).

Anterior and posterior nostrils in a tube, the anterior situated on top of snout, the posterior on top of head before eye.

1. **Muraena (Muraena) pardalis** Schleg.

Muraena pardalis Schlegel, Fauna japonica, Poissons, 1847, p. 268.

Muraena pardalis Bleeker, Act. Soc. Sc. Indo-neerl. III. 1858, 4. Bijdr. Japan p. 30. — Nat. Tijdschr. Ned. Indië XV. 1858, p. 461. — l. c. XVI. 1858—59, p. 205.

Gymnothorax pardalis Bleeker, Atl. Ichth. IV. 1864, p. 86.

Muraena pardalis Günther, Cat. Brit. Mus. VIII. 1870, p. 99.

Muraena pardalis Jordan & Snyder, Proc. U. S. Nat. Mus. XXIII. 1901, p. 879.

Muraena kailuae Jordan & Evermann, Bull. U. S. fish Comm. XXII. (1902) 1904, p. 165.

Muraena lampra Jenkins, Bull. U. S. fish Comm. XXII (1902) 1904, p. 423.
Muraena kauila Jenkins, Ibid. p. 424.
Muraena kailuae Snyder, Ibid. p. 518. — Jordan & Evermann, Ibid. XXIII. (1903) 1905, p. 88.
Muraena kailuae Jordan & Seale, Bull. U. S. Bur. fish. XXV. (1905) 1906, p. 196.
Muraena pardalis Günther, Fische d. Südsee, Heft IX. 1910, p. 408.

Height 9—16; head about $6^1/_2$ to $7^1/_2$, twice to 2.4 in trunk. Tail a little longer than head and trunk. Eye $8^1/_2$ to 11, 2—$2^1/_2$ times in snout, situated slightly behind middle of cleft of mouth, which goes about $2^1/_2$ times or somewhat less in length of head, is horizontal and not closing completely. Origin of

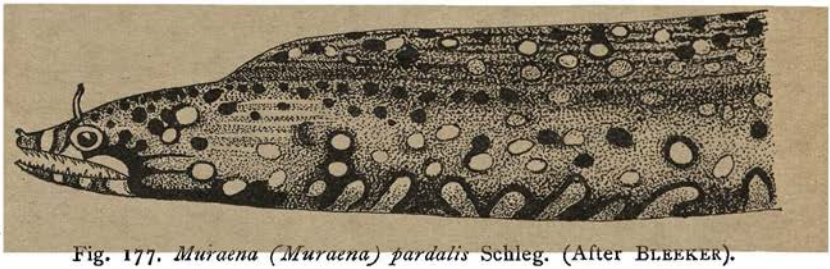

Fig. 177. *Muraena (Muraena) pardalis* Schleg. (After BLEEKER).

dorsal before gillopenings, which are horizontal and not much wider than the eye. Teeth in maxillaries, mandibularies and on intermaxillary plate in young specimens in two series, which fuse into each other with age, constituting a single series of large, caniniform teeth with small intermediate teeth. Two to three teeth on the centre of the intermaxillary plate are depressible fangs as also some of the peripheral series. On vomer 7—10 rather small teeth in a single series, which may decrease in number with age. Dark brown, clouded with darker; everywhere covered with numerous round, whitish or yellowish-dark edged ocelli, partly confluent and larger on the lower parts. Lower jaw with light and dark crossbars. Length 760 mm. [Type of the species and a specimen of BLEEKER's collection in the Leiden Museum seen by us].

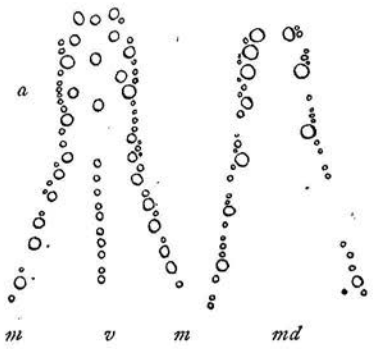

Fig. 178. Dentition of *Muraena (Muraena) pardalis* Schleg. *a* intermaxillary; *m* maxillary; *md* mandibulary; *v* vomerine teeth. nat. size.

Habitat: Java; Cocos Island. — Japan, Mauritius, Savaii, Tahiti and Sandwich Islands.

On reefs and near shore.

2. Subgenus **Strophidon** Mc Clelland.

(Mc Clelland, Calcutta Journ. Nat. Hist. V. 1844, p. 187).

Posterior nostrils without tube. Height 40—51. Teeth without serrature.

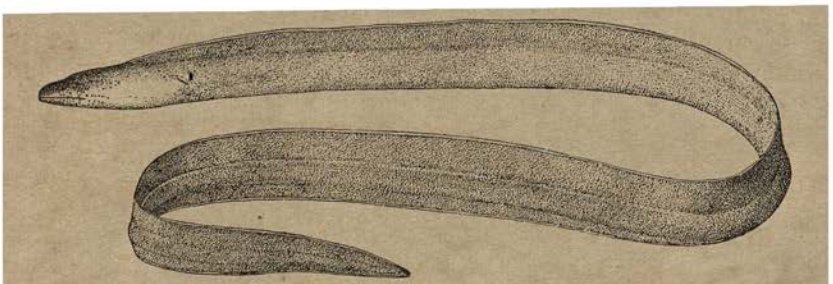

Fig. 179. *Muraena (Strophidon) brummeri* Blkr. × 2/5.

1. **Muraena (Strophidon) brummeri** Blkr.

Muraena Brummeri Bleeker, Nat. Tijdschr. Ned. Indië XVII. 1858—59, p. 137.
Strophidon polyodon Bleeker, Ned. Tijdschr. Dierk. II. 1864—65, p. 47.
Pseudechidna Brummeri Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 272. — Atl. Ichth. IV. 1864, Pl. XVIII. fig. 1.
Strophidon Brummeri Bleeker, Atl. Ichth. IV. 1864, p. 109.
Strophidon polyodon Bleeker, Ibid. p. 109.
Muraena brummeri Günther, Cat. Brit. Mus. VIII. 1870, p. 128.
Muraena polyodon Günther, Ibid. p. 128.
Muraena taenioides Günther, Proc. Zool. Soc. 1871, p. 674.
Strophidon Brummeri Jordan & Snyder, Proc. U. S. Nat. Mus. XXIII. 1901, p. 855.
Muraena brummeri Günther, Fische d. Südsee, IX. 1910, p. 420.
Gymnothorax megapterus Max Weber, Siboga-Expeditie, Fische, 1913, p. 57.

Exceedingly elongate, height 40—51; head 12—17, 4.6—7 in trunk. Head and trunk nearly equal to tail or nearly one third shorter. Eye about 17—20, nearly in the middle of the cleft of the mouth, which shuts completely and goes 4 or less in length of head. Snout acutely rounded; more than twice as long as eye and 7 times in length of head. Dorsal commencing about at the end of the second third of the head, its height anteriorly more or less than half the height of the body; above the anus higher than or about as high as the height of the body underneath, farther behind it may even increase compared

with the tail underneath. Teeth conical, compressed, partly depressible, in the maxillaries 8—12, mostly uniserial; they may be biserial (*polyodon*) or only on one side so. On the intermaxillary plate a peripheral series of 9 to 20 and 2 to 3 mesial ones; on vomer a single series of about 4—10; in the mandibles 12—24 in one row, the anterior ones may be irregularly biserial. Brownish olive or sulphur yellow (when alive), anterior part of head with small blackish dots, fins with a white margin. Length 800 mm. [Type of *G. megapterus* in the Zoological Museum of Amsterdam].

Habitat: Nias!; Bawean!; Savu!; Timor; Ambon!; Ceram; New Guinea. — Madagascar, Mauritius, Japan, Pacific Islands.

3. Subgenus **Gymnothorax** Bloch.

(Bloch, Ausländ. Fische IX. 1795, p. 83).

Posterior nostrils a round or oval opening on the top of the head before eye, sometimes provided with a rim, but never with a tube. Height less than 30. Teeth without serrature.

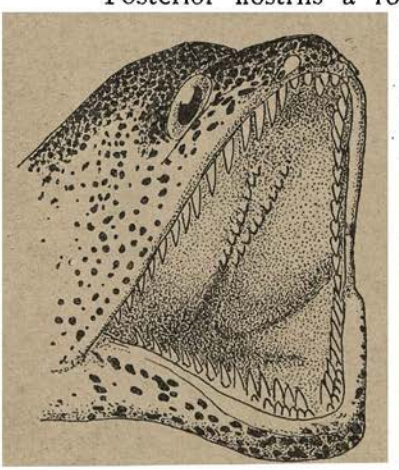

Fig. 180. Opened mouth of *Muraena (Gymnothorax) picta* Ahl, to show the mesial tooth immediately behind the peripheral series of intermaxillary teeth which it equals in size. Vomerine teeth in a double series.

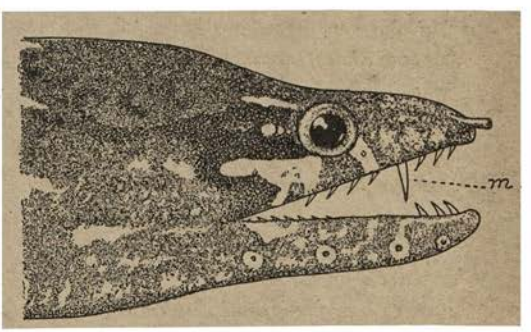

Fig. 181. Head of *Muraena (Gymnothorax) zonipectis* Seale, with opened mouth to show the mesial depressible fang (*m*) on the intermaxillary plate. × 2.

Artificial key to the indo-australian species of the Subgenus Gymnothorax.

A. Mesial teeth on intermaxillary plate conical, not longer than those of the peripheral series, one or two in number (Fig. 180).

a. Maxillary teeth in one series [1]) . . . . *M.* (*G.*) *picta* p. 363.
b. Maxillary teeth in two series . . . . . *M.* (*G.*) *thyrsoidea* p. 365.

B. Mesial teeth on intermaxillary plate depressible, more or less slender fangs (Fig. 181).

A. Posterior nostrils with an elevated tubiform rim. Snout long and narrow, gape wide, twice in head. 35—40 teeth on each side of mandibles. Colour uniform. *M.* (*G.*) *schismatorhynchus* p. 366.
B. Posterior nostrils without elevated rim.
I. Maxillary teeth in two or three series, the inner one at least of 5 teeth, generally more.
1. Cleft of mouth twice to nearly thrice in head. Head 1.7—2.9 in trunk. Peripheral teeth of intermaxillary plate in two series. *M.* (*G.*) *meleagris* p. 367.
2. Cleft of mouth about $3^1/_2$ in head. Head 4—5 in trunk. Peripheral teeth of intermaxillary plate in two series . . . . . *M.* (*G.*) *polyuranodon* p. 369.
3. Cleft of mouth 3.8—4.2 in head. Head thrice or somewhat less in trunk. A single peripheral series of teeth on intermaxillary plate. . . . . *M.* (*G.*) *tile* p. 370.
II. Maxillary teeth in one series, or with an anterior inner series of 1—4 fanglike ones, which disappear with age.
1. Head, trunk and tail with distinct dark crossbands [2]).
a. About 30 irregular crossbands, partly encircling the body, about as broad as the interspaces, which are spotted in their dorsal part. . . . . *M.* (*G.*) *punctatofasciata* p. 371.
b. 17—24 crossbands, interrupted on the belly, generally larger than the interspaces. First band through snout . . . *M.* (*G.*) *petelli* p. 372.
c. 15—20 crossbands, encircling the body, much narrower than the interspaces. First band through eye. . . . . *M.* (*G.*) *rüppelli* p. 372.
2. Gillopenings in a dark brown or black patch. Head more than 3—3.5 in trunk. *M.* (*G.*) *flavimarginata* p. 374.

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1) In very young specimens in 2 series. They can however easily be recognised on account of their colour, which is yellowish with rows of dark spots or small circles.
2) In old specimens the bands are sometimes only distinct on head and dorsal part of trunk and tail.

3. Head, trunk and tail with distinct dark spots, more or less arranged in rows. Gillopenings not in a dark patch.
   a. Spots smaller than interspaces, those on head much the smallest. Head 2.5—3.3 in trunk. Cleft of mouth $2^2/_3$ in head . . . . . *M.* (*G.*) *melanospilus* p. 375.
   b. Spots smaller than interspaces, those on the head smallest and sometimes wanting. Head 2—$2^3/_5$ in trunk. Cleft of mouth 2—$2^1/_2$ in head . . . . . *M.* (*G.*) *undulata* var. *fimbriata* p. 376.
   c. Spots larger than interspaces, those on the head not smaller. Head 3 in trunk. Cleft of mouth $2^1/_3$—$2^1/_2$ in head. *M.* (*G.*) *favaginea* var. *isingteenà* p. 378.
4. A dark brown streak behind corner of mouth. More or less distinct white spots on jaws. No large dark spot behind eye. No white spots on body and tail . . . *M.* (*G.*) *chilospilus* p. 379.
5. A large dark brown spot behind eye, bordered superiorly by a narrow white line. White spots on jaws; body and tail without white spots or stripes . . . . . *M.* (*G.*) *zonipectis* p. 381.
6. A large oblong black patch on temporal region. Body and tail with rows of white spots or vertical stripes . . . . . *M.* (*G.*) *margaritophora* p. 382.
7. Head, trunk and tail more or less distinctly marbled or reticulated. Gillopenings not in a dark patch. No dark spot behind eye or at corner of mouth. No distinct white spots on jaws.
   a. Yellowish, marbled and reticulated with dark brown, sometimes finely mottled with dark and yellowish. Vomerine teeth in 2 series, except in old specimens, where they are uniserial . . . . . *M.* (*G.*) *richardsoni* p. 383.
   b. Groundcolour dark, with a network of white or yellowish lines. Vomerine teeth uniserial.
      a. Tail considerably shorter than head and body. Lines on body and tail very fine. Head 2.6—2.9 in trunk. . . . . *M.* (*G.*) *pseudothyrsoidea* p. 384.

β. Tail longer than or nearly equal to head and trunk. Lines on body and tail rather coarse. Head 2—2.6 in trunk . . . . . *M.* (*G.*) *undulata* var. *undulata* p. 376.

γ. Tail a little longer or shorter than head and trunk. Lines on body and tail rather coarse. Head 3 in trunk. *M.* (*G.*) *favaginea* var. *favaginea* p. 378.

8. Head, trunk and tail uniform brown.

a. Dorsal high, above anus about equal to height of body. Height 20—26 . *M.* (*G.*) *hepatica* p. 385.

b. Dorsal moderately developed, lower than height above anus. Height 12—20 *M.* (*G.*) *boschi* p. 386.

Doubtful species . . . . . *M.* (*G.*) *micropoëciluis* p. 387.

1. Muraena (Gymnothorax) picta Ahl [Fig. 175, 180, p. 356, 360].

Muraena picta Ahl, De Muraena & Ophichtho, Dissert. Upsala 1789, p. 6.
Gymnothorax pictus Bloch, Schneider, System. Ichth. 1801, p. 529.
Muraenophis pantherina Lacépède, Hist. nat. poissons, V. 1803, p. 628, 641, 643.
Muraena variegata Quoy & Gaimard, Voyage Uranie, Zool. 1824, p. 246.
Muraena lita Richardson, Voy. Erebus & Terror, Fish. 1844, p. 84.
Muraena siderea Richardson, l. c. p. 85.
Muraena lita Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 294. — Verh. Batav. Gen. XXV. 1853, Muraenoid. p. 47.
Muraena pfeifferi Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 173. — Verh. Batav. Gen. XXV. Aanhangsel 1853, Muraenoiden p. 73.
Sidera pfeifferi Kaup, Cat. Apod. fish 1856, p. 70.
Sidera pantherina Kaup, l. c. p. 71.
Muraena polyophthalmus Bleeker, Acta Soc. Sc. indo-neerl. III. 10e Bijdr. Celebes, 1858, p. 15.
Gymnothorax pantherinus Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 152.
Gymnothorax pictus Bleeker, Atl. Ichth. IV. 1864, p. 87.
Gymnothorax polyophthalmus Bleeker, Ibid. p. 96.
Muraena picta Günther, Fish. Zanzibar, 1866, p. 126.
Gymnothorax pictus Kner, Fische Novara 1865—1867, p. 384.
Muraena polyophthalmus Günther, Cat. Brit. Mus. VIII. 1870, p. 109.
Muraena picta Günther, Ibid. p. 116.
Muraena picta Day, Fish. India 4° 1878—1888, p. 672.
Muraena picta Steindachner, Abh. Senckenb. nat. Ges. XXV. 1901, p. 457.
Gymnothorax pictus Jordan & Evermann, Bull. U. S. fish Comm. XXIII. (1903) 1905, p. 103.
Gymnothorax pictus, *litus*, *polyophthalmus* Jordan & Seale, l. c. XXV. (1905) 1906, p. 198, 199.
Muraena picta Günther, Fische d. Südsee, Heft IX. 1910, p. 419.
Gymnothorax pictus Kendall & Goldsborough, Mem. Mus. Comp. Zool. Harvard Coll. XXVI. 1911, p. 246.
Gymnothorax pictus M. Weber, Siboga-Expeditie, Fische 1913, p. 59.
Gymnothorax polyophthalmus M. Weber, Ibid. p. 59.

Height 15 to more than 20; head about 6—8, more than twice to 2.7 in trunk. Head and trunk somewhat longer than tail. Eye 10—12, twice or less than twice in snout, situated above middle of cleft of mouth, which goes 2.5 to 3 times in length of head and is horizontal and closing completely. Snout 6 times or less in length of head, bluntly rounded. Origin of

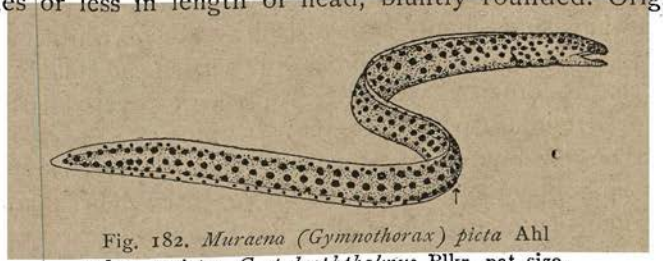

Fig. 182. *Muraena (Gymnothorax) picta* Ahl
colour variety: *G. polyophthalmus* Blkr. nat size.

dorsal slightly before gillopenings. Teeth sharp, pointed; those in the maxillaries in a single series, in very young specimens in 2 series, the inner of which disappears gradually. On the intermaxillary plate a single series of 10—14 stouter teeth, with a single central one, which is pointed-conical; in young specimens there are 2 or 3 teeth, one behind the other as

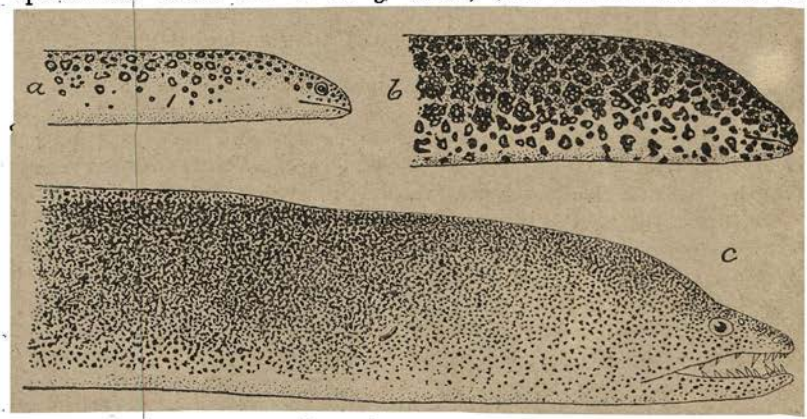

Fig. 183. Three stages of *Muraena (Gymnothorax) picta* Ahl with corresponding change of coloration. Specimen *a* of 165 mm., *b* of 255 mm., *c* of 734 mm length.

also an outer peripheral series of small teeth. On vomer in young specimens one short series, which later on gets irregularly and incompletely biserial; in old specimens 2 short series. Mandibulary teeth in young biserial; the outer series of small teeth disappears with age and remains only anteriorly. Colour

changing strongly with age. The original colour is yellow, ornamented with round, blackish spots, about of the size of the eye, arranged in three irregular, longitudinal series. These spots get a yellow centre (*polyophthalmus* see fig. 182). Later on they are increasing in size as also their light centre, whilst their periphery gets irregular; still later on they are broken up and the fish is finally brownish gray above, whitish below, covered by an infinite number of very small black spots, whilst the abdomen is generally whitish or covered with a few round or irregular spots. Length 750 mm.

Habitat: Sumatra (West coast); Java (Batavia, Prigi, Patjitan, Wijnkoops Bay!); Island Sailus ketjil!; Celebes (Makassar, Tanawanko, Tombariri, Menado); Reef de Bril near Celebes!; Muaras Reef!; Sanguisiapo (Sulu Archipelago)!; Karakelang Islands (Beo!); Buru; Ambon!; Ceram; Batjan; Ternate; New Guinea (Doreh, Humboldt Bay!); Schouten Island (Mysore); Banda!; Island Roma!; Timor; Rotti!; Sumba!. — East coast of Africa to Natal, Madagascar, South Arabia to West Pacific Islands, Australia, Philippines, Riu Kiu Islands.

On reefs and near shore.

2. **Muraena (Gymnothorax) thyrsoidea** Rich.

Muraena thyrsoidea Richardson, Voyage Sulphur Ichth. 1844, p. 111 (nec figura 1 tab. 49). — Voyage Erebus & Terror, Fish. 1844, p. 91.
Muraena griseo-badia Richardson, Voyage Erebus & Terror, Fish. 1844, p. 89.
Muraena thyrsoidea Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 1312.
Muraena prosopeion Bleeker, Nat. Tijdschr. Ned. Indië IV. 1853, p. 300. — Verh. Batav. Gen. XXV. 1853, Muraenoid. p. 73.
Thyrsoidea griseo-badia Kaup, Cat. Apodal fish, 1856, p. 74.
Thyrsoidea arenata Kaup, Ibid. p. 85.
Gymnothorax prosopeion Bleeker, Atl. Ichth. IV. 1864, p. 88.
Gymnothorax thyrsoideus Bleeker, Ibid. p. 103.
Muraena thyrsoidea Günther, Cat. Brit. Mus. VIII. 1870, p. 113.
Muraena thyrsoidea Day, Fish. India 4°. 1878—1888, p. 672.
Muraena tile Seale, Occ. Papers Bishop Mus. I. N°. 3, 1901, p. 62 (nec Hamilton Buchanan) [cfr. citat. sequ.].
Gymnothorax thyrsoideus Jordan & Seale, Bull. Bur. fish. XXV. (1905) 1906, p. 198.
Muraena thyrsoidea Günther, Fische d. Südsee, Heft IX. 1910, p. 419.

Height 17—21; head 9 to more than 10, thrice in trunk. Head and body somewhat shorter than tail. Eye 10—11, less than twice shorter than snout, which is obtusely rounded and goes nearly 7 times in length of head. Cleft of mouth reaching far behind eye, horizontal, not closing completely in old

specimens, about thrice or somewhat more in length of head. Fins low, origin of dorsal before gillopenings. Maxillary teeth in 2 series, in the outer series 16—20 teeth, conical, compressed and more numerous than the inner series. On intermaxillary plate a peripheral series of 10—14 larger teeth and one or two central conical ones. On vomer 2 series, anteriorly diverging and approaching the series on the intermaxillary plate; the anterior tooth in each series conspicuously larger. The mandibulary teeth in an outer series of 18—25, anteriorly with an inner series of 3—6 much stouter teeth. Brownish, all over minutely dotted and speckled with darker brown and white, less on head. Length 650 mm. [A specimen of *G. prosopeion* of BLEEKER's collection seen by us].

Habitat: Sumatra (Kauer, Priaman, Benkulen); Borneo; Cocos-Island; Java (Patjitan, Karangbollong); Ambon; Ceram; Batjan; Halmaheira; Timor. — Pinang, Burmah, Andaman Islands, Muscat, Seychelles, Rodriguez, China, West-Australia, Pacific Islands.

On coral reefs and near shore.

3. **Muraena (Gymnothorax) schismatorhynchus** Blkr.

Muraena schismatorhynchus Bleeker, Nat. Tijdschr. Ned. Indië, IV. 1853, p. 301.
Eurymyctera crudelis Kaup, Cat. Apodal Fish 1856, p. 73.
Muraena congeroides Bleeker, Act. Soc. Scient. Indo-Neerl. VIII. 1860, Achtste Bijdr. Vischfauna Sumatra, p. 87.
Gymnothorax crudelis Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 168.
Gymnothorax schismatorhynchus Bleeker, Atl. Ichth. IV. 1864, p. 106.
Muraena schismatorhynchus Günther, Cat. Brit. Mus. VIII. 1870, p. 127.
Rhinamuraena eritima Jordan & Seale, Bull. Bur. Fish. Washington XXV. (1905) 1906, p. 196.
Rhinechidna eritima Barbour, Proc. Biol. Soc. Washington XXI. 1908, p. 41.
Muraena schismatorhynchus Günther, Fische der Südsee, Heft IX. 1910, p. 410.

Height 14—22.5, head $6^2/_3$—8, 2.6—3 in trunk. Head and trunk $^1/_{10}$—$^1/_3$ longer than tail. Eye $8^1/_2$—11, situated above the middle of the cleft of the mouth, which is wide and goes about twice in the head. The mouth can not be shut completely. Snout long and narrow, twice or thrice the diameter of eye. Tube of anterior nostril wider at its top than at its base, almost half as long as eye. Posterior nostrils with an elevated rim forming a short tube. Dorsal and anal rather well developed, the former beginning before gillopenings. Maxillaries with a series of 25—30 rather small teeth, and anteriorly with an

inner row of 3—6 longer ones, which are wanting in old specimens. Intermaxillary plate with a peripheral series of 12—20 teeth, most of them very long canines, and with a mesial series of 3—4 canines. Vomer with about 10 conical teeth in one series. Mandibles with a row of 35—40 rather small teeth, near the symphysis however some of them are large canines;

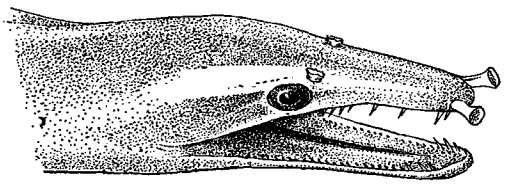

Fig. 184. *Muraena* (*Gymnothorax*) *schismatorhynchus* Blkr. (After the type of KAUP).

in young specimens there is near the symphysis an inner row of 2 or 3 canines. Grayish brown, lighter below, fins with a diffuse submarginal dark band and a white margin. Length more than 800 mm. [Specimens quoted by BLEEKER from the Leiden Museum and the type of KAUP seen by us].

Habitat: Sumatra (Benkulen); Java!; Timor!. — Samoa Islands.

4. **Muraena (Gymnothorax) meleagris** Shaw.

Muraena meleagris Shaw, Natur. Miscell. 1809, pl. 220.
Muraena meleagris Richardson, Voy. Erebus & Terror, Fish. 1844, p. 93.
Muraena griseo-badia Bleeker, Nat. Tijdschr. Ned. Indië, VIII. 1855, p. 325 [nec Richardson].
Muraena Duivenbodei Bleeker, Nat. Tijdschr. Ned. Indië, X, 1856, p. 385.
Thyrsoidea chlorostigma Kaup, Cat. Apod. fish 1856, p. 89.
Thyrsoidea meleagris Kaup, Ibid. p. 91.
Muraena buroënsis Bleeker, Nat. Tijdschr. Ned. Indië XIII. 1857, p. 79.
Muraena chlorostigma Bleeker, Ibid. XV. 1858, p. 160.
Thyrsoidea eurosta Abbott, Proc. Acad. Nat. Sc. Philadelphia 1860, p. 478.
Gymnothorax Duivenbodei Bleeker, Atl. Ichth. IV. 1864, p. 89.
Gymnothorax buroënsis Bleeker, Ibid. p. 90.
Gymnothorax chlorostigma Bleeker, Ibid. p. 97.
Gymnothorax griseo-badius Bleeker, Ibid. p. 105 [nec Richardson].
Muraena meleagris Günther, Cat. Brit. Mus. VIII. 1870, p. 100.
Muraena buroënsis Günther, Ibid. p. 114.
Muraena duivenbodii Günther, Ibid. p. 114.
Muraena meleagris Day, Fish. India 4°. 1878—1888, p. 668.
Muraena afra Max Weber, In Semon Zoolog. Forschungsreisen V. 1895, p. 275 [nec Bloch, nec Günther].
Lycodontis eurosta Fowler, Proc. Acad. Nat. Sc. Philadelphia 1900, p. 494.
Lycodontis parvibranchialis Fowler, Ibid. p. 494.
Muraena laysana Steindachner, Denkschr. Akad. Wien LXX. 1900, p. 515.

Gymnothorax leucostictus Jenkins, Bull. U. S. fish. Comm. XXII. (1902) 1904, p. 425. — Jordan & Evermann, Ibid. XXIII. (1903) 1905, p. 96.
Gymnothorax ercodes Jenkins Ibid. XXII. (1902) 1904, p. 428. — Jordan & Everman, Ibid. XXIII. (1903) 1905, p. 95.
Gymnothorax chalazius Waite, Rec. Austral. Mus. V. 1904, p. 145.
Gymnothorax eurostus Jordan & Evermann, Bull. U. S. fish. Comm. XXIII. (1903) 1905, p. 92.
Gymnothorax laysanus Jordan & Evermann, Ibid. XXIII. (1903) 1905, p. 93 (s. syn.).
Gymnothorax meleagris Jordan & Everman, Ibid. XXIII. (1903) 1905, p. 94.
Muraena meleagris Günther, Fische d. Südsee, Heft IX. 1910, p. 410.
Gymnothorax eurostus Fowler, Proc. Acad. Nat. Sc. Philadelphia 1912, p. 21.
Gymnothorax laysanus Fowler, Ibid. p. 21.
Gymnothorax monochrous Max Weber, Siboga Exp. Fische 1913, p. 59 [nec Blkr].
Gymnothorax monochrous? de Beaufort, Bijdragen tot de Dierkunde. Afl. 19, 1913, p. 100 (nec Blkr.).

Height 12—18; head 6 to $8^3/_4$, 1.7—2.9 in trunk. Tail equal to or slightly longer than head and trunk. Eye 7—10, about $1^1/_2$ times in snout, which goes $5^1/_2$ to more than 6 times in head. Cleft of mouth horizontal, at least in adults not closing completely, reaching far behind eye, twice to nearly three times in head. Origin of dorsal before gillopenings, which are rather wider than eye. Maxillary teeth in 2 series, an outer one of about 13 to more than 20 small, subequal, compressed teeth inclined backwards, and an inner series of 8 or more, stouter, conical teeth. There may be in young specimens a third outer series of small, soon disappearing teeth. Intermaxillary plate with an outer series similar to the outer maxillary ones, inside of them a group of caniniform teeth of which 2—3 median ones are the strongest. On vomer a single or an incompletely biserial series. In each mandible a series of about 20 to 30 compressed, subequal teeth, inside of them anteriorly about 6 canines. These teeth as also the inner maxillary ones and those on intermaxillary plate are depressible. The coloration shows many varieties of which the following have been observed in our region.

a. Brown with numerous white or yellow spots; gillopenings may be black (*meleagris, chlorostigma*).

b. Brown with numerous more or less distinct and more or less distant small or irregularly ovate or transverse black spots (*buroënsis, griseo-badius* BLKR., *duivenbodi*), sometimes almost uniformly brown.

Outside our region the most distinct varieties are:

c. Brown with black and white spots, irregularly distributed or arranged in longitudinal series (*laysanus*).

d. On a whitish groundcolour the brown is arranged in a somewhat regular network, giving the appearance of indistinct whitish spots surrounded by polygonal brownish interspaces, which are most distinct on the tail (*ercodes*).

Length approaching 1000 mm. [Specimens of *G. buroënsis, griseobadius* and *chlorostigma* of BLEEKER's collection seen by us].

Habitat: Sumatra (Trussan, Siboga); Singapore; Batu Islands; Nias, Simalur!; Cocos Island; Java (Anjer, Prigi, Patjitan); Paternoster Islands!; Bali; Beo, Karakelang-Islands!; Sangir Islands; Ternate; Buru; Ambon!; Ceram; Solor!; New Guinea. — Indo-pacific region from east coast of Africa and Mauritius to Sandwich Islands, Australia and Japan.

On reefs and near shore.

5. Muraena (Gymnothorax) polyuranodon Blkr.

Muraena polyuranodon Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 248. — Verh. Bat. Gen. XXV. 1853, Muraenoid. p. 70.
Polyuranodon Kuhlii Kaup, Cat. Apod. fish 1856, p. 96.
Muraeno-blenna tigrina Kaup, Ibid. p. 98 (p.p.).
Gymnothorax polyuranodon Bleeker, Atl. Ichth. IV. 1864, p. 89.
Muraena polyuranodon Günther, Cat. Brit. Mus. vol. VIII, 1870, p. 114. — Fische d. Südsee, Heft IX. 1910, p. 421.

Height 19 to 28; head 9 to more than 11, 4 to 5 times in trunk. Tail somewhat shorter than head and trunk. Eye 10—12, more than 1.5 in snout, situated above middle of cleft of mouth, which goes more or less than $3^1/_2$ times in length of head, is horizontal and closes completely. Origin of dorsal slightly before gill-openings, which are a little wider than the eye. Teeth conical, with the sharp point directed backwards, in the maxillaries in 2 or 3 series, on the intermaxillary plate in 2 peripheral series, the teeth of the inner series stouter, in the centre 1 or 2 compressed, recurved, moveable teeth; on vomer a

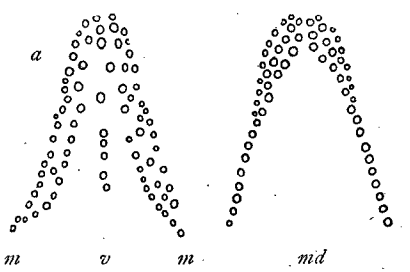

Fig. 185. Dentition of *Muraena (Gymnothorax) polyuranodon* Blkr. *a* intermaxillary, *m* maxillary, *md* mandibulary, *v* vomerine teeth.

single series of 5 to 10 teeth. Mandibulary teeth posteriorly uni- to triserial, anteriorly stouter and bi- to quadriserial. Yellowish brown, with irregular rounded, more or less confluent black spots. On the head the spots coalesce into more or less complete longitudinal bands, separated by light longitudinal streaks. Length 700 mm.

Habitat: Sumatra (Priaman, Rindu Lati above Benkulen); Java; Borneo; Palawan; Celebes (Sawatan, Klabat di atas, Menado); Buru; Ambon!; Ceram; Waigeu; North New Guinea (rivers running in Humboldt Bay!). — Fidji Islands.

In fresh water of rivers and in the mouth of rivers.

6. **Muraena (Gymnothorax) tile** (Ham. Buch.) [Fig. 176, p. 356].

Muraenophis tile Hamilton Buchanan, Fish. Ganges 1822, p. 18, 363.
Muraena vermiculata Richardson, Voy. Erebus & Terror, Fish. 1844, p. 92.
Muraena gracilis Richardson, l. c. p. 92.
Lycodontis literata Mc Clelland, Calc. Journ. Nat. Hist. V. 1845, p. 186.
Lycodontis punctata Mc Clelland, Ibid. p. 187.
Strophidon literata Mc Clelland, Ibid. p. 203, 215.
Strophidon punctata Mc Clelland, Ibid. p. 203, 215.
Strophidon maculata Mc Clelland, Ibid. p. 203.
Muraena punctata Bleeker, Verh. Bat. Gen. XXV. 1853, Muraenoid. p. 42.
Muraena literata Bleeker, l. c. p. 42.
Muraena tile Bleeker, Verh. Batav. Gen. XXV. 1853, Ichth. Bengalen, p. 159. — Nat. Tijdschr. Ned. Indië IX. 1855, p. 427.
Thyrsoidea tile Kaup, Cat. Apodal Fish 1856, p. 93.
Gymnothorax tile Bleeker, Atl. Ichth. IV. 1864, p. 97.
Gymnothorax tile Kner, Fische Novara-Exped., 1865—1867, p. 385.
Muraena tile Günther, Cat. Brit. Mus. VIII. 1870, p. 112.
Muraena tile Day, Fish. India 4°. 1878—1888, p. 668.

Height 16—23; head 7.4 to nearly 8, thrice or somewhat less in trunk. Tail somewhat shorter than or equal to head and trunk. Eye 12—14, half as long or less than snout, situated nearer to angle of mouth than to end of snout, which is prominent. Cleft of mouth, measured from mandibulary symphysis, 3.8—4.2 in head. Origin of dorsal slightly before gillopenings, which are about as wide as the eye. Teeth conical. In the maxillaries in an outer series of 14 or more and an inner series of 5—8, these and the last of the outer series are larger. This is still more the case with the single peripheral series of about 12—14 on the intermaxillary plate, which may be mingled with a few small ones and enclose a mesial series of 3 still larger teeth. In the vomer 20 or more obtusely conical teeth in 2

series or at least irregularly biserial. Each mandible with about 24 teeth, only anteriorly biserial. Brown or brownish black, with numerous irregular, very small specks, unequal in size, disappearing more or less with age on the anterior part of the body. Length about 600 mm. [Some specimens of BLEEKER's collection seen by us].

Habitat: Sumatra (Priaman, Palembang, Deli, Lower Langkat); Singapore; Banka; Borneo (Bandjermassin, Singkawang); Ceram. — Philippines, Bourbon, Andamans, seas and estuaries of Bengal.

Seas and estuaries, entering fresh water.

7. Muraena (Gymnothorax) punctatofasciata (Blkr.).

Muraena catenata Bleeker, Act. Soc. Sc. Indo-neerl. I. 1856, Beschr. vischsoorten Ambon p. 66 (nec Richardson).

Gymnothorax punctatofasciatus Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 167. — Atl. Ichth. IV. 1864, p. 99.

Muraena punctatofasciata Günther, Cat. Brit. Mus. VIII. 1870, p. 106.

Muraena punctatofasciata Day, Fishes of India 4°. 1878—1888, p. 669.

Height 21—27, head 8.3—9; 2.7 to more than 3 in trunk. Head and trunk about 1.2 in tail. Eye $8^1/_2$—10, situated somewhat nearer to end of snout than to corner of mouth. Snout not very much longer than eye, pointed. Cleft of mouth three times or somewhat more in length of head. The mouth can be shut completely. Dorsal rather low, beginning before gill-openings, which are rather wider than the eye. In the maxillaries on each side a series of 16—18 rather short pointed equal teeth. In young specimens there is anteriorly an inner row of three long and slender teeth. Intermaxillary plate with a peripheral series of 10—12 teeth and a median row of three long fang-like ones. A single series of 8—11 short teeth on the vomer. In the mandibles 16—18 moderately pointed teeth in a single row on each side, those near the symphysis much larger and less regularly arranged. Yellowish brown above, lighter below, back and dorsal with small brown spots. Body with about 30 irregular crossbands, about as broad as the interspaces between them. Some of them encircle the body, others are only incompletely developed. Length more than 470 mm. [A specimen of unknown locality in the zoological Museum of Amsterdam examined by us].

Habitat: Buru; Ambon; Ceram. — Zanzibar, British India, Philippines.

Note. This species has been recorded by WAITE (Rec. Australian Mus. VI. 1905, p. 58) from Western Australia, but MC CULLOCH (Rec. Western Austr. Mus. I. (2) 1912, p. 80) identified the specimen in question as his *G. woodwardi.*

8. **Muraena (Gymnothorax) petelli** Blkr.

Muraena Petelli Bleeker, Nat. Tijdschr. Ned. Indië XI. 1856, p. 84.
Muraena interrupta Kaup, Cat. Apodal Fish 1856, p. 67.
Gymnothorax Petelli Bleeker, Atl. Ichth. IV. 1864, p. 99.
Muraena petelli Günther, Cat. Brit. Mus. VIII. 1870, p. 105.
Gymnothorax leucacme Jenkins, Bull. U. S. Fish. Comm. XXII. (1902) 1904, p. 427.
Gymnothorax waialuae Snyder, Ibid. p. 520.
Gymnothorax petelli Jordan & Richardson, Bull. Bureau Fish. XXVII. (1907) 1908, p. 240.
Muraena petelli Günther, Fische der Südsee, Heft IX. 1910, p. 412.

Height 18—20, head 8—$9^2/_3$, $2^2/_5$—3 times in trunk. Tail longer than head and trunk. Eye 9—10, situated somewhat nearer to the end of the snout than to the corner of the mouth. Snout rather pointed, not twice as long as eye. Cleft of mouth about $2^1/_4$ times in head. Mouth not shutting completely in old specimens. Dorsal rather low, beginning before gillopenings, which are about as wide as eyes. Maxillaries with a series of 12—14 conical, somewhat compressed teeth, anteriorly with an inner series of three long depressible teeth, which disappear with age. On intermaxillary plate a peripheral series of about 12 rather long depressible teeth, mesially with 2 or 3 larger fang-like ones. Vomer with a single series of 3 conical teeth. Mandibles with 18—25 teeth on each side in a single series. Brown, with 17—24 dark crossbands, which are generally larger than the interspaces between them. They are interrupted on the belly. The first band on the snout, the third through origin of dorsal. In old examples most of the bands are broken into spots, but the anterior dorsal bands remain distinct. Length 1100 mm. [Specimens of BLEEKER's collection in the Leiden Museum seen by us].

Habitat: Java (Ora Malang); Ambon. — Mauritius, Red Sea, Indian Ocean, Philippines, Riu-Kiu Islands, Pacific to Sandwich Islands.

9. **Muraena (Gymnothorax) rüppelli** Mc Clell.

Muraena colubrina Lacépède, Hist. nat. Poiss. V. 1803, p. 627, 641, 642 (nec Boddaert).

Muraena reticulata Rüppell, Atl. Reise Nördl. Afrika, Fische d. Roth. Meer. 1828, p. 117 (nec Bloch).
Muraena colubrina Richardson, Voyage Erebus & Terror, Fish. 1844, p. 88 (nec Boddaert).
Dalophis rupelliae Mc Clelland, Calcutta Journ. Nat. Hist. V. 1845, p. 213.
Muraena colubrina Bleeker, Nat. Tijdschr. Ned. Indië VI. 1854, p. 335.
Thyrsoidea colubrina Kaup, Cat. Apodal Fish, 1856, p. 84.
Gymnothorax reticularis Bleeker, Atl. Ichth. IV. 1864, p. 98 (nec Bloch).
Muraena rüppellii Günther, Cat. Brit. Mus. VIII. 1870, p. 104.
Muraena Rüppellii Klunzinger, Abh. Zool. bot. Ges. Wien XXI. 1871, p. 615.
Muraena Rüppelli Day, Fish. India 4°. 1878—1888, p. 669.
Muraena rüppelli Steindachner, Abh. Senckenb. Naturf. Ges. XXV. 1901, p. 458.
Muraena rüppellii Günther, Fische d. Südsee, Heft IX. 1910, p. 412.

Height 16—25; head about 8 to 9, $2^1/_3$ to $2^3/_4$ in trunk. Head and trunk nearly 1.2 to 1.4 in tail. Eye 7 to more than 9, situated nearer to corner of mouth than to end of snout, which is pointed, not prominent; less than half the length of the eye and more or less than $5^1/_2$ times in length of head. Cleft of mouth rather wide, shutting completely, 2.5 to 2.9 in length of head. Tubes of anterior nostrils shorter than vertical diameter of eye. Dorsal rather low, commencing before gill-openings, which are about as wide as eyes. Maxillaries with an outer series of about 15 or less conical, somewhat compressed teeth, anteriorly with an inner series of 2—4, disappearing with age. On intermaxillary plate a peripheral series of about 10—12 partly strong teeth, mesially 2 fang-like, somewhat compressed depressible teeth. Vomer with a series of about 6 or more conical teeth. 15 to more than 20 mandibulary teeth, anteriorly partly with moderately developed canines, irregularly disposed in two series. Head, body and fins encircled by 15—20 complete, black rings, considerably narrower than the yellowish or reddish brown interspaces. With age the dorsal part of the rings becomes somewhat diffuse and the upper half of the interspaces are reticulated with dark. The first ring through the eye, the second behind corner of mouth, the third in front or across gillopenings; end of snout and mostly tip of tail free. Length 550 mm. [Some specimens of BLEEKER's collection seen by us].

Habitat: Sumatra; Batu Islands; Java (Prigi); Cocos Islands; Borneo; Celebes (Menado); Sangir Islands; Buru; Ambon; Ceram; Ternate; New Guinea (Humboldt Bay!, German New Guinea!); Flores; Rotti!; Timor. — Red Sea, Andamans, Ceylon, Pacific Islands (Ponapé, Samoa, Kandavu, Paumotu Islands).

10. Muraena (Gymnothorax) flavimarginata Rüpp.

Muraena flavimarginata Rüppell, Atl. Reise nördl. Afrika, Fische des Rothen Meeres, 1828, p. 119.
Muraena pratbernon Richardson, Zool. Voy. Erebus & Terror, 1844, p. 84 (nec Q.G.).
Muraena batuensis Bleeker, Nat. Tijdschr. Ned. Indië XII. 1856—1857, p. 241.
Muraena javanica Blecker, Nat. Tijdschr. Ned. Indië XIX. 1859, p. 347.
Gymnothorax rhodocephalus Bleeker, Ned. Tijdschr. Dierk. II. (1864) 1865, p. 50. — Atl. Ichth. IV. 1864, p. 93.
Gymnothorax formosus Bleeker, Ned. Tijdschr. Dierk. II. (1864) 1865, p. 50. — Atl. Ichth. IV. 1864, p. 94.
Gymnothorax javanicus Bleeker, Atl. Ichth. IV. 1864, p. 95.
Gymnothorax flavimarginatus Bleeker, l. c. p. 95.
Muraena formosa Günther, Cat. Brit. Mus. VIII. 1870, p. 111.
Muraena flavomarginata Günther, l. c. p. 119.
Muraena flavimarginata Klunzinger, Verhandl. zool. bot. Ges. Wien XXI. 1871, p. 615.
Muraena javanica Klunzinger, l. c. p. 616.
Muraena flavimarginata Day, Fishes of India 4°. 1878—1888, p. 671.
Gymnothorax thalassopterus Jenkins, Bull. U. S. Fish. Comm. XXII. (1902) 1904, p. 427.
Gymnothorax flavimarginatus Jordan & Evermann, Bull. U. S. Fish. Comm. XXIII. (1903) 1905, p. 99.
Gymnothorax flavomarginatus Seale, Occas. Papers Bernice Pauahi Bishop Mus. IV. N°. 1, 1906, p. 9.
Gymnothorax flavomarginatus Jordan & Richardson, Bull. Bureau Fish. XXVII. (1907) 1908, p. 240.
Muraena flavimarginata Günther, Fische der Südsee, Heft IX. 1910, p. 417.
Gymnothorax flavimarginatus Fowler, Proc. Acad. Nat. Science Philadelphia LXIV. 1912, p. 22.
Gymnothorax batuensis Fowler, l. c. p. 22.

Height 15—22; head 8—9, more than 3 to 3.5 in trunk. Head and trunk equal to or about one tenth shorter than tail. Eye 8—11, about in the middle above the cleft of the mouth. Snout rather short, less than twice diameter of eye. Anterior nostrils in a very short tube. Cleft of mouth 2.3—2.5 in length of head. The mouth can be shut completely. Dorsal moderately developed, beginning before gillopenings, which are about equal to diameter of eye. In the maxillaries on each side a row of about 11—15 compressed conical teeth, in young specimens there is anteriorly an inner row of 3 long and slender teeth. On the intermaxillary plate a peripheral series of 8—10 long teeth, with some smaller teeth between them, and a median series of 3 or 2 fang-like ones. Vomer with two series of small conical teeth, diverging anteriorly and forming one irregular series posteriorly; the teeth on the forked part often seem to be wanting, in which case the vomerine teeth are

irregularly biserial or uniserial. Mandibles with 15—20 teeth on each side, the foremost longer than the others, which are compressed and conical. Near the symphysis there are generally some larger teeth, placed at the inner side of the toothrow. Yellowish, densely covered with dark brown spots; these spots may fuse into larger irregular patches, in which case only a yellowish network from the groundcolour is left. Dorsal and anal often with a light border, that of the anal broader than that of the dorsal. Corner of mouth sometimes with a dark patch. Gillopenings always in a dark brown or black patch. Length 1500 mm. [Types of *G. formosus, javanicus* and *rhodocephalus* in the British Museum seen by us. A specimen of *G. flavimarginatus* of BLEEKER's collection in the Zoological Museum of Amsterdam seen by us].

Habitat: Sumatra (Priaman, Padang); Batu Islands; Java (Prigi, Patjitan!); Ambon!; Ceram!; Misol; Timor-Laut; New Guinea (Humboldt Bay!). — East coast of Africa, Madagascar, Bourbon, Mauritius, Seychelles, Red Sea, seas of India, Philippines, Formosa, Pelew Islands, Pacific Islands to Sandwich Islands.

This species is characterized by its short head and rather short snout and may moreover easily be identified by the dark patch, in which the gillopenings are placed.

11. Muraena (Gymnothorax) melanospilus Blkr.

Muraena melanospila Bleeker, Nat. Tijdschr. Ned. Indië IX. 1855, p. 279.
Gymnothorax melanospilus Bleeker, Atl. Ichth. IV. 1864, p. 96.
Muraena melanospila Günther, Cat. Brit. Mus. VIII. 1870, p. 109.
Muraena melanospila Alleyne & Macleay, Proc. Linn. Soc. N.S.W. I. 1877, p. 353.
Muraena melanospila Macleay, Descript. Cat. Fishes of Australia 1881, p. 219.
Gymnothorax pescadoris Jordan & Evermann, Proc. U. S. Nat. Mus. XXV. 1902, p. 326.
Gymnothorax melanospilos Jordan & Richardson, Mem. Carnegie Mus. IV. 1909, p. 174.

Height 14—18; head about 7—9, $2^1/_2$—3.3 in trunk. Tail equal to or a little longer than body. Eye 10—12; one half of the length of the snout, situated above the middle of the cleft of the mouth, the length of which is contained about twice and two thirds in that of the head. Cleft of mouth not closing. Snout short and compressed. Origin of dorsal before gillopenings which are wider than the eye. Teeth uniserial; in the maxillaries about 14 conical, somewhat compressed ones, the

2 anterior small, the 2 or 3 following stouter than the rest. On intermaxillary plate a peripheral series of about 8 teeth, caniniform and much stronger than the maxillary ones, mixed with a few small ones, enclosing 2 stout mesial teeth. About 9 conical teeth on vomer. In each lower jaw about 15 teeth, the anterior much stronger and caniniform. The caniniform teeth are depressible. Brown, with round or oval black spots, generally larger than the eye, and longitudinally arranged. Spots on head much the smallest. Fins with or without a narrow white edge. Length 1000 mm. [The type of the species in the British Museum seen by us].

Habitat: Sumatra (Siboga); Buru. — Darnley Island; Formosa; Pescadores Islands.

12. Muraena (Gymnothorax) undulata (Lac.).

? *Muraenophis stellata* Lacépède, Hist. Nat. Poissons V. 1803, p. 629 & 644.
Muraenophis undulata Lacépède, l. c. p. 629 & 644.
Muraena fimbriata Bennett, Proc. Comm. Zool. Soc. 1. 1831, p. 168.
Muraena Valenciennii Eydoux & Souleyet, Voyage autour du Monde sur la Bonite, Zoologie, 1841, p. 207.
Muraena bullata Richardson, Zool. Voyage Erebus & Terror, 1844, p. 86.
Muraena cancellata Richardson, Ibid. p. 87.
Muraena isingleenoïdes Bleeker, Verh. Bat. Gen. XXV. 1853, Muraenoid. p. 48.
? *Muraena Blochii* Bleeker, Ibid. p. 49.
Muraena Agassizi Bleeker, Nat. Tijdschr. Ned. Indië VIII. 1855, p. 458.
Muraena isingteena Bleeker, Ibid. IX. 1855, p. 277 (nec Richardson).
Thyrsoidea isingleenoides Kaup, Cat. Apod. Fish 1856, p. 74.
Thyrsoidea cancellata Kaup, Ibid. p. 76.
Thyrsoidea bullata Kaup, Ibid. p. 81.
? *Muraena acutirostris* Abbott, Proc. Acad. Nat. Sc. Philadelphia 1860, p. 476.
Thyrsoidea Kaupi Abbott, Ibid. p. 477.
Gymnothorax isingleenoides Bleeker, Atl. Ichth. IV. 1864, p. 91.
Gymnothorax bullatus Bleeker, Ibid. p. 91.
Gymnothorax cancellatus Bleeker, Ibid. p. 93.
Gymnothorax Agassizi Bleeker, Ibid. p. 95.
? *Gymnothorax Blochi* Bleeker, Ibid. p. 102.
Gymnothorax cancellatus Kner, Fische Novara Exp. 1865—1867, p. 384.
Muraena fimbriata Günther, Cat. Brit. Mus. VIII. 1870, p. 108.
Muraena microspila Günther, Ibid. p. 109.
Muraena undulata Günther, Ibid. p. 110.
Muraena undulata Klunzinger, Verhandl. Zool. bot. Ges. Wien, XXI. 1871, p. 615.
Gymnothorax fimbriatus Bleeker, Versl. Akad. Amsterdam (2) VII. 1873, p. 37.
Muraena fimbriata Day, Fishes of India 4⁰. 1878—1888, p. 670.
Muraena undulata Day, Ibid. p. 671.
? *Lycodontis acutirostris* Fowler, Proc. Acad. Nat. Sc. Philadelphia 1900, p. 494.
Lycodontis Kaupi Fowler, Ibid. p. 494.

Gymnothorax undulatus Jordan & Evermann, Bull. U. S. Fish. Comm. XXIII. (1903) 1905, p. 98.

? *Eurymyctera acutirostris* Jordan & Evermann, Ibid. p. 105.

Gymnothorax undulatus Seale, Occasional papers Bernice Pauahi Bishop Mus. IV. 1906, p. 9.

Muraena undulata Günther, Fische d. Südsee, Heft IX. 1910, p. 413.

Gymnothorax stellatus Fowler, Proc. Acad. Nat. Sc. Philadelphia LXIV. 1912, p. 21.

Gymnothorax undulatus Fowler, Ibid. p. 21.

Gymnothorax stellatus Snyder, Proc. U. S. Nat. Mus. XLII. 1912, p. 492.

Gymnothorax favagineus Max Weber, Siboga-Exp. Fische 1913, p. 56 [nec Bloch, Schneider].

Gymnothorax macassariensis Max Weber, Siboga-Exp. Fische 1913, p. 61 [nec Blkr.].

Gymnothorax sagenodeta Max Weber, Ibid. p. 61 [nec Richardson].

Height 14—22; head $6^1/_2$—8, 2—2.6 in trunk. Tail half length of head longer than or nearly equal to head and trunk. Eye 8.5 to more than 10, situated about in the middle of the cleft of the mouth, which goes 2—$2^1/_2$ times in head. Even in adult specimens the mouth can nearly be closed completely. Snout rather long, compressed, $1^1/_2$—$1^3/_4$ diameter of eye. Anterior nasal tubes much shorter than diameter of eye. Dorsal and

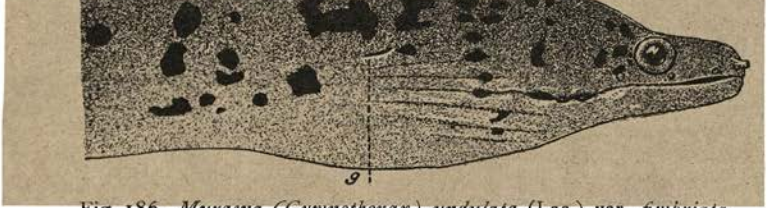

Fig. 186. *Muraena (Gymnothorax) undulata* (Lac.) var. *fimbriata*. *g* gillopening. nat. size.

anal well developed, the former beginning before gillopenings. In the maxillaries a row of 12—20 compressed teeth, the anterior ones the largest. In young specimens anteriorly an inner row of 3—1 large, depressible teeth. Intermaxillary plate with a peripheral series of 10—16 teeth, which are larger than those of the maxillaries and with a median series of 3 fang-like teeth. Vomer with 10 or less small teeth in an irregular series. Mandibulary teeth 18—30, compressed, pointed, the anterior ones longer and more irregularly placed, the posterior ones in a single row. In the variety *fimbriata* the colour is reddish brown, with several irregular longitudinal rows of black round or irregularly oval spots, which are generally not much

larger than the eye; those on the head are smaller and may be wanting. On the tail they are often also arranged in transverse rows, giving a more or less striped appearance to this part. Dorsal and anal often with a light border. These spots may partly be confluent, in which case the fish is yellowish, densely reticulated and marmorated with brown (*M. agassizi*). In the variety *undulata* the spots have still more gained in extension and the groundcolour is blackish, lighter on the belly, with a wide network of more or less dendritic white or yellowish lines, which are more numerous on the head, giving to this part a mottled appearance. Length 1500 mm.

Habitat: Sumatra (Aru Bay!, Siboga, Priaman, Padang, Benkulen, Kauer); Nias!; Batu-Islands; Pulu Weh!; Singapore; Java (Batavia, Prigi, Patjitan, Anjer, Karangbollong, Penandjung Bay!); Borneo (Balikpapan Bay!); Sangir Islands; Beo, Karakelang Islands!; Saleyer!; Buru; Ambon!; Ceram; Ternate; Waigeu; New Guinea (Kaimana!); Aru Islands!; Timor; Banda!; Flores!; Pulu Serbete!. — Madagascar, Mauritius, East coast of Africa, Red Sea, coasts of British India, Philippines, Formosa, China, Riu-Kiu Islands, Australia, Pacific Islands as far as the Sandwich Islands.

13. **Muraena (Gymnothorax) favaginea** Bl. Schn.

Gymnothorax favagineus Bloch, Schneider, Systema Ichth. 1801, p. 525.
Muraena isingteena Richardson, Fishes Voyage Sulphur 1843—1845, p. 108.
Muraena isingleena Richardson, Zool. Voyage Erebus & Terror, 1844, p. 86.
Muraena tesselata Richardson, Fishes Voyage Sulphur 1843—1845, p. 109. — Zool. Erebus & Terror, 1844, p. 88.
Muraena tesselata Bleeker, Nat. Tijdschr. Ned. Indië V. 1853, p. 530.
Muraena python Kaup, Cat. Apod. fish 1856, p. 68.
Muraena favaginea Kaup, l. c. p. 68.
Thyrsoidea isingleena Kaup, l. c. p. 75.
Thyrsoidea tesselata Kaup, l. c. p. 76.
Gymnothorax isingteena Bleeker, Atl. Ichth. IV. 1864, p. 92.
Gymnothorax tesselatus Bleeker, l. c. p. 93.
Muraena tesselata Günther, Cat. Brit. Mus. VIII. 1870, p. 106.
Muraena tesselata Day, Fishes of India 4°. 1878—1888, p. 671.

Height $15^1/_2$—$21^1/_2$. Head $7^1/_2$—9, 3 times in trunk. Tail a little longer or shorter than head and trunk. Eye 10—12, about twice in snout, situated above the middle of the cleft of the mouth, which goes $2^1/_3$—$2^1/_2$ times in length of head. Tube of anterior nostrils much shorter than diameter of eye. Dorsal and anal moderately developed, the former beginning before

gillopenings. Maxilllary teeth rather small and pointed in one row of about 15, anteriorly occasionally one or two canines at the inner side of the maxillary row. On the intermaxillary plate a peripheral series of unequal caniniform teeth, 10—15 in number, and a row of 2 or 3 larger canines mesially. Vomer with a single row of 8—10 teeth, much shorter than the others. Mandibles with a single row of 15—22 teeth on each side, the three foremost of which are much larger than the others, which are pointed and directed backwards. Head, body and fins with large polygonal or rounded black spots separated by narrow white lines (*favaginea*) or by distinct interspaces of the ground-colour, all or most of the spots being wider than the interspaces (*isingteena*). Length over 1100 mm. [A specimen of *G. tesselatus* of BLEEKER's collection seen by us].

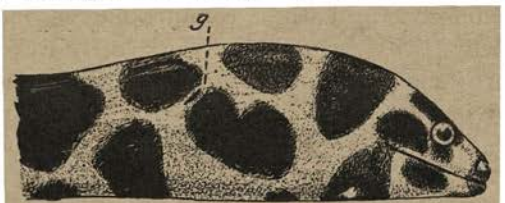

Fig. 187. *Muraena (Gymnothorax) favaginea* Bl. Schn. × 1½.

Habitat: Sumatra (Kauer, Benkulen, Priaman, Siboga); Batu Islands; Singapore; Duizend-Islands; Java (Prigi); Celebes (Makassar); Halmaheira; Aru-Islands; New Guinea (Doreh). — East coast of Africa, Mauritius, coast of South Arabia and British India, New Hebrides, Samoa Islands, Paumotu Islands.

14. **Muraena (Gymnothorax) chilospilus** (Blkr.).

? *Muraena Mulleri* Kaup, Cat. Apod. fish 1856, p. 69.
Gymnothorax chilospilus Bleeker, Ned. Tijdschr. Dierk. II. 1864 (1865), p. 52. — Atl. Ichth. IV. 1864, p. 103.
Gymnothorax sagenodeta Bleeker, Atl. Ichth. IV. 1864, p. 100 (nec Richardson).
? *Gymnothorax Mülleri* Bleeker, Atl. Ichth. IV. 1864, p. 103.
Muraena nubila Günther, Cat. Brit. Mus. VIII. 1870, p. 117 (pro parte).
Muraena nubila von Martens, Preuss. Exp. nach Ost-Asien, Zool. I. 1876, p. 406 (nec Richardson).
Gymnothorax detactus Jordan & Seale, Bull. Bureau Fisheries Washington XXV. (1905) 1906, p. 201 (nec Bryan & Herre).
Gymnothorax lineatus Jordan & Seale, Ibid. p. 202 (nec Lesson, nec syn.).
Gymnothorax samalensis Seale, Philippine Journ. of Science IV. 1909, p. 492.
Muraena chilospilus Günther, Fische der Südsee, Heft IX. 1910, p. 415.
Gymnothorax richardsoni Max Weber, Siboga-Exp. Fische 1913, p. 60 (pro parte).

Gymnothorax richardsonii de Beaufort, Bijdragen tot de Dierkunde, Afl. 19, 1913, p. 100 (pro parte).

Height 15—22. Head 7.2—8.5, 2.2—2.8 in trunk. Tail exceeding head and trunk by half length of head or more. Eye 8—9, situated above the middle of the cleft of the mouth, 1.5 in snout, which is pointed and rather compressed. Anterior nostrils less than half eye. Cleft of mouth 2.5—3 in length of head. Gillopenings less wide than eye. Dorsal and anal rather feebly developed, the former beginning before gillopenings. Maxillaries with a series of 10—12 strong compressed teeth, anteriorly with an inner row of 1—4 longer ones. Intermaxillary plate with a peripheral series of about 14 teeth, and a mesial series of 1—3 canines, which is sometimes wanting. Vomer with a single series of 6—11 small teeth, which sometimes are irregularly arranged. Mandibles with a row of 12—20 compressed teeth on each side. Near the symphysis there is a short inner row of 2 or 3 longer ones. Colour brown with dark brown wavy, incomplete and anastomosing cross-bands, generally more conspicuous on tail and on dorsal and anal fins and sometimes almost wanting. Anal often with a white margin. Head brown, the pores on upper and lower jaw in white spots, the hindermost of which on the lower jaw is much larger and extends to the gape. A dark brown streak behind corner of mouth and behind it sometimes an other white spot. These spots are generally bright in young specimens, but fade in older ones. In many preserved specimens the skin appears distinctly folded, the folds crossing each other and forming scale-pouches. Length 330 mm. [Types of *G. sagenodeta* and *G. chilospilus* of BLEEKER in the British Museum seen by us].

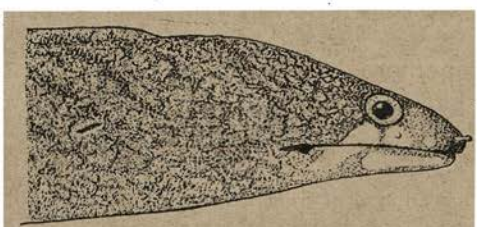

Fig. 188. *Muraena (Gymnothorax) chilospilus* (Blkr.). × 1½.

Habitat: Sumatra (Benkulen, Atjeh!); Lumu-Lumu shoal on Borneo Bank!; Beo, Karakelang Islands!; Sanguisiapo, Sulu Archipelago!; Celebes (Makassar!); Saleyer!; Kabaëna-Island!; Buru; Ambon!; Ceram; Sumba!; Flores!; Savu!; Timor!; Kei-Islands!; Damar-Island!; Waigeu!. — Philippines, Salomon Islands, Rarotonga, Tahiti and Samoa Islands.

Note. GÜNTHER (Cat. Brit. Mus. VIII, p. 117) united this species with *M. nubila* Rich., but afterwards (Südseefische, l.c.) he separated it again, as no transitions between the typical coloration of the head of *M. chilospilus* and that of *M. nubila* could be found. He remarks, that all specimens known are of comparative small size and that therefore it may be the young stage of an other species. In our material however we have a specimen from Kei-Islands of 240 mm. in which the ovaria contain well developed, although not quite ripe eggs. This species is closely related to *M. zonipectis* (Seale), which has however an other pattern of the spots on the head, and to *M. richardsoni*. From lastnamed species it may be distinguished by its more pointed snout, its longer tail, smaller gillopenings and by having generally only one row of teeth on the vomer.

15. **Muraena (Gymnothorax) zonipectis** (Seale) [Fig. 181, p. 360].

Gymnothorax zonipectis Seale, Occ. Papers Bernice Pauahi Bishop Mus. IV. 1906, p. 7.
Gymnothorax indong Seale, Philippine Journ. of Science IV. 1909. p. 491.
Muraena zonipectus Günther, Fische d. Südsee, Heft IX. 1910, p. 415.

Height about 17; head 6.7; 2—2½ in trunk. Head and trunk one length of head or less shorter than tail. Eye about 10, nearly twice in snout, situated above posterior half of cleft of mouth, which goes about 2.5 times, the snout about 5.5 times in length of head. Tube of anterior nostrils nearly thrice in length of snout. Dorsal rather low, commencing above gill-openings. Teeth conical, acute, 14—16 small ones in maxillaries, with 2—4 stouter ones anteriorly at inner side of them. On intermaxillary plate a peripheral series of about 12 caniniform, compressed teeth; two mesial teeth, an anterior shorter and a posterior very long one, in the level of the most posterior teeth of the peripheral series of the intermaxillary plate, both are depressible. A few teeth on vomer in a single series. In each mandible about 25 or more compressed teeth in a single series, the most anterior caniniform. Reddish brown with 2—5 longitudinal rows of darkbrown dendritic spots, which are more or less transversely united into narrow crossbands, which are most conspicuous on the fins. Head mottled with white and brown. Behind eye a large darkbrown spot, bordered superiorly by a narrow white line, inferiorly by a broad white band

extending to below eye and upperlip, lower jaw with white round spots and bands. Length 450 mm.

Habitat: South coast of Java (Wijnkoops Bay!). — Philippines; Tahiti; Rotuma.

16. **Muraena (Gymnothorax) margaritophora** Blkr.

? *Muraena stellifera* Richardson, Zool. Voyage Erebus & Terror, 1844, p. 86.
Gymnothorax margaritophorus Bleeker, Ned. Tijdschr. Dierk. II. (1864) 1865, p. 53. — Atl. Ichth. IV. 1864, p. 97.
? *Muraena stellifera* Günther, Cat. Brit. Mus. VIII. 1870, p. 101.
Gymnothorax talofa Jordan & Seale, Bull. Bur. Fish. XXV. (1905) 1906, p. 201.
Lycodontis margaritophorus Douglas Ogilby, Mem. Queensland Mus. I. 1912, p. 34.

Height 16—20. Head 7—7.3, 2—2.3 in trunk. Head and trunk 1.2—1.3 in tail. Eye about 8, less than twice in snout, which is rather sharp. Cleft of mouth $2^1/_4$—$2^1/_2$ in head. Jaws not shutting completely. Dorsal beginning before gillopenings. Dorsal and anal moderately developed. Maxillaries with an outer series of about 15 rather small compressed teeth, and an anterior inner row of about 5 longer ones. On the intermaxillary plate a peripheral series of about 15 teeth, most of them much longer than those of the maxillaries and mesially a series of 2 or 3 fang-like ones. A single series of 5 or more small teeth on vomer. Mandibles with a series of closely set, rather short compressed teeth, about 22 on each side; near the symphysis 4 or 5 canines, irregularly biserial. Reddish brown, lighter below. A large oblong black patch on the temporal region, beginning immediately behind eye and sometimes broken up in 3 or 4 smaller spots. Sometimes some smaller spots on the cheek. Body and tail with 3 or 4 longitudinal rows of white spots or vertical stripes. Dorsal posteriorly with a white margin. Length over 200 mm. [Type of the species in the British Museum seen by us].

Habitat: Ambon!. — Queensland, Samoa.

Note. Only four specimens, all of small size, are known of this strikingly coloured species. GÜNTHER (Fische der Südsee, Heft IX. 1910, p. 413) united it with *M. undulata*. It may be possible that it is a young stage of this species, but as no transitional stages are known, as far as we are aware, we think it better to keep it as a distinct species for the present.

17. Muraena (Gymnothorax) richardsoni Blkr.

? *Muraenophis flaveola* Lesson, Voyage Coquille, Zool. 1830, p. 128.
Muraena grisea Cuv.? Bleeker, Verh. Bat. Gen. XXII. Bijdr. Ichth. Bali, (1848) 1849, p. 11.
Muraena Richardsonii Bleeker, Nat. Tijdschr. Ned. Indië III, 1852, p. 296.
Muraena ceramensis Bleeker, Ibid. p. 297.
Muraena scoliodon Bleeker, Verh. Bat. Gen. XXV. 1853, Muraenoid. p. 43.
Muraena Troschelii Bleeker, Ibid. p. 45.
Muraena florisiana Bleeker, Nat. Tijdschr. Ned. Indië VI. 1854, p. 334.
Muraena vermicularis Peters, Monatsber. Akad. Berlin, 1855, p. 459.
Muraena diplodon Peters, Ibid. p. 460.
Muraena venosa Kaup, Cat. Apodal Fish 1856, p. 68.
Thyrsoidea ceramensis Kaup, Ibid. p. 87.
Thyrsoidea multifasciata Kaup, Ibid. p. 87.
Gymnothorax floresianus Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 252.
Gymnothorax venosus Bleeker, Ibid. p. 272.
Gymnothorax Richardsoni Bleeker, Atl. Icht. IV. 1864, p. 100.
Gymnothorax scoliodon Bleeker, Ibid. p. 101.
Gymnothorax ceramensis Bleeker, Ibid. p. 101.
Gymnothorax richardsonii Kner, Fische Novara-Exp. 1865—1867. p. 385.
Muraena richardsoni Günther, Cat. Brit. Mus. VIII. 1870, p. 118.
Gymnothorax richardsoni Jordan & Richardson, Bull. Bureau Fish. Washington XXVII. (1907) 1908, p. 240.
Gymnothorax richardsonii Günther, Fische der Südsee, Heft IX. 1910, p. 414.

Height 14—20. Head 6.5—7.5, 2.2—2.7 in trunk. Tail equal to or a little longer than head and trunk. Eye 8—10, situated above the middle of the cleft of the mouth, which goes 2.5—3 times in length of head. Snout conical, slightly compressed, about $1^1/_2$ times diameter of eye. Anterior nostrils about half as long as eye. Gill-openings as wide as the eye. Dorsal and anal moderately developed, the former beginning somewhat before the gillopenings. Maxillaries with a series of 8—12 strong, but rather short, compressed teeth, in older specimens their number may decrease to 5. In young specimens anteriorly an inner row of 3—4 more slender ones. Intermaxillary plate with a peripheral series of 8 to 16 teeth, not much stronger than those on the maxillaries and a mesial

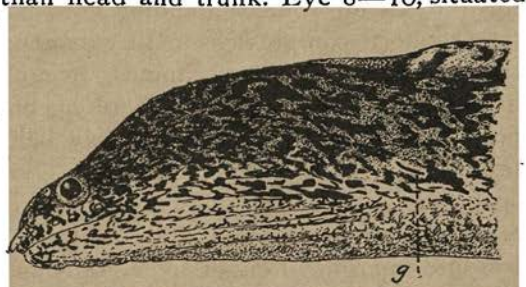

Fig. 189. *Muraena (Gymnothorax) richardsoni* Blkr. *g* gillopening. × $1^1/_2$.

series of 1—3 canines, which is sometimes wanting. Vomer in old specimens with a single series, in younger ones generally with two series of small teeth, 10—20 in number. Mandibulary teeth in a single row, 10—20 on each side; the anterior ones less regularly arranged and longer than the others. Yellowish or brownish, marbled and reticulated with dark brown. On the dorsal fin and on the tail the dark colour forms an incomplete network of wide mashes or irregular crossbands. Some specimens, where the dark colour prevails, are finely mottled with dark and yellowish. No black spots or stripes at corner of mouth. Gillopenings without black spot. In most preserved specimens the skin appears distinctly folded, the folds crossing each other and forming scale-pouches. Length 900 mm. [Typical specimens of *G. ceramensis*, *scoliodon* and *troscheli* of BLEEKER's collection in the Leiden Museum seen by us].

Habitat: Sumatra (Pulu Tikus near Benkulen, Padang, Siboga); Java; Borneo; Bali; Celebes (Menado); Sanguisiapo in the Sulu Archipelago!; Sangir Islands; Ternate; Halmahera; Ceram; Goram; Ambon; Buru; Flores; Solor!; Sumba!; Timor!; Aru-Islands!; Salawatti!; Waigeu!; Schouten Islands. — Zanzibar, Socotra, Cargados Carajas in the Indian Ocean, Philippines, Australia, Pacific Islands to the Sandwich Islands.

18. **Muraena (Gymnothorax) pseudothyrsoidea** Blkr.

Muraena pseudothyrsoidea Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 778. — Verh. Bat. Gen. XXV. 1853, Muraenoid. p. 44.

Gymnothorax makassariensis Bleeker, Ned. Tijdschr. Dierkunde I. 1863, p. 168. — Atl. Ichth. IV. 1864, p. 104.

Gymnothorax pseudothyrsoideus Bleeker, Atl. Ichth. IV. 1864, p. 104.

Muraena macassariensis Günther, Cat. Brit. Mus. VIII. 1870, p. 111 (nec. syn.).

Muraena pseudothyrsoidea Günther, l. c. p. 112.

? *Muraena pseudothyrsoidea* Day, Fishes of India, 4°. 1878—1888, p. 670.

? *Gymnothorax philippinus* Jordan & Seale, Bull. Bureau Fisheries Washington XXVI (1906) 1907, p. 7.

Gymnothorax pseudothyrsoideus Jordan & Richardson, Memoirs Carnegie Mus. IV. 1909, p. 173.

Height 14—20; head 7 to nearly 8, 2.6—2.9 in trunk. Tail shorter than head and trunk. Eye 8—12, twice (specimens of 563 mm.) or less in snout. Cleft of mouth 2.1—2.3 in length of head. Gillopenings narrower than eye. Mouth not shutting completely in large specimens. Dorsal and anal rather well developed, the former beginning before gillopenings. Maxillaries

with one series of 12—13 compressed teeth and in young specimens anteriorly with an inner row of 1—3 larger ones. Intermaxillary plate with a peripheral series of about 10—12 teeth and a mesial series of 3 canines. Vomer with a single row of 3—9 small teeth. Mandibles with a single row of about 19 teeth. In younger specimens the teeth near the symphysis are irregularly biserial. Brownish with more or less conspicuous very fine white or yellow lines, forming a network; sometimes almost uniform dark brown. Length over 560 mm. [Type of *M. pseudothyrsoidea* in the British Museum and of *M. makassariensis* in the Leiden Museum seen by us].

Habitat: Celebes (Makassar!); Ambon. — Zanzibar, Muscat, Seychelles, Chagos Archipelago, British India?, Philippines?, China?, Riu-Kiu Islands?, Darnley Island.

19. Muraena (Gymnothorax) hepatica Rüpp.

Muraena hepatica Rüppell, Atl. Reise Nördl. Afrika Fische d. Roth. Meer. 1828, p. 120.
Muraena albimarginata Schlegel, Fauna japon. Poissons II. 1847, p. 267.
Muraena albimarginata Bleeker, Nat. Tijdschr. Ned. Indië XIII. 1857, p. 77.
Gymnothorax albimarginatus Bleeker, Atl. Ichth. IV. 1864, p. 107.
Muraena hepatica Günther, Cat. Brit. Mus. VIII. 1870, p. 122.
Muraena hepatica Klunzinger, Abh. zool. bot. Ges. Wien XXI. 1871, p. 614.
Gymnothorax albimarginatus Snyder, Proc. U. S. Nat. Mus. XLII. 1912, p. 492.
Gymnothorax hepaticus M. Weber, Siboga-Exped. Fische 1913, p. 57.

Height 20—26; head 8—9; 3 to more than 3.5 in trunk. Tail equal to or a little longer or shorter than head and trunk. Eye 8—10, situated above the middle of the cleft of the mouth, 1.7 to twice in snout, which is bluntly rounded, not prominent and goes about 5 to 6 times in length of head. Cleft of mouth wide, can be shut completely, 2.3 to 3 in length of head. Dorsal high, before anus about half height of body, above anus about equal to height, on tail even higher than body underneath, its origin in advance of gillopenings, which are scarcely wider than eye. Anal much lower. Teeth acute, partly somewhat compressed, a series of about 10—12 in maxillaries, the anterior of which are stouter; anteriorly, inside of them in young specimens about 4 teeth, which decrease in number with age and finally disappear. On intermaxillary plate a peripheral series of about 10 caniniform teeth and 2 large fang-like depressible mesial ones. On vomer a series of 5—10 small conical teeth, which may decrease to two. Mandibles with a

single series of more or less than 15 teeth, anteriorly with a few depressible, caniniform teeth at their inner side. Uniform brown, fins with a white margin. Length 966 mm.

Habitat: Java (Banjuwangi); Island Kanjungan Ketjil!; Island Saleyer!; Buru; Ambon!. — Red Sea, Region of Madagascar (Sauvage), Japan.

20. Muraena (Gymnothorax) boschi Blkr.

Muraena Boschi Bleeker, Verh. Bat. Gen. XXV. 1853, Muraenoid. p. 52.
Muraena monochrous Bleeker, Nat. Tijdschr. Ned. Indië X. 1856, p. 384.
Gymnothorax Boschi Bleeker, Atl. Ichth. IV. 1864, p. 105.
Gymnothorax monochrous Bleeker, l. c. p. 106.
? *Gymnothorax maculaepinnis* Steindachner, Sitzber. Akad. Wien LIII. 1866, p. 473 [nec Blkr.].
Muraena afra Günther, Cat. Brit. Mus. VIII. 1870, p. 123 (pro parte).
? *Muraena afra* Day, Fishes of India 4°. 1878—1888, p. 671.

Height 12—20, head 7.8—8, 2.7— 2.8 in trunk. Head and trunk equal to tail or about $^1/_4$ of length of head shorter. Eye 9—11, situated about above the middle of the cleft of the mouth, which goes 2.2—2.6 in head. The mouth can be shut completely. Gillopenings not much narrower than eye. Dorsal and anal moderately developed, the former beginning before gillopenings. Maxillaries with an outer row of 12—16 rather pointed teeth, and anteriorly with an inner row of 1—4 larger ones, which disappear with age. Intermaxillary plate with a peripheral series of 12—20 teeth, which are longer than those of the maxillaries, and with a mesial series of 2 or 3 long canines. Teeth on vomer uni- or subbiserial, 7—9, smaller than the other ones. In each mandible 18—24 teeth, the posterior ones equal to those of the maxillaries, the anterior ones larger, in young specimens an inner series near symphysis of about 4 large ones. Colour uniform brown, lighter below. Length over 600 mm.

Nom. indig.: Ladu (Ternate).

Habitat: Simalur!; Sumatra (Siboga, Benkulen); Singapore; Java; Celebes?; Ambon; Roti!; Ternate; Sangir Islands.

GÜNTHER united this species with *Gymnothorax afer* Bl. from the Atlantic. Under this name several later authors mention an eel from the Red Sea, the Indic and from Australia. We have no material to decide if this species is the same as *G. boschi*.

Doubtful species.

1. Muraena (Gymnothorax) micropoëcilus Blkr.

Muraena micropoëcilus Bleeker, Nat. Tijdschr. Ned. Indië VIII. 1855, p. 459.
Gymnothorax micropoëcilus Bleeker, Atl. Ichth. IV. 1864, p. 105.
Muraena micropoecilus Günther, Cat. Brit. Mus. VIII. 1870, p. 94, foot-note.

Height 19, head 8.6, 2.8 in trunk. Tail one length of head longer than head and body. Eye 7—8. Snout much less than twice diameter of eye. Gape of mouth $2^1/_3$—$2^1/_2$ in head. Dorsal and anal moderately developed, the former beginning before gillopenings, which are about as wide as eye. Maxillaries with an outer row of about 9 small teeth and anteriorly with 3 fang-like ones in an inner row. A peripheral series of about 16 teeth on intermaxillary plate [1]), and two mesial fangs. A single series of 11 small teeth on vomer. Mandibles with about 16 teeth on each side and one canine at their inner side near symphysis. Brown, densely spotted with darker. Length 216 mm. [Type of the species in bad state, seen by us in the British Museum].

Habitat: Singapore; Cocos-Island; Java (Patjitan); Ambon; Roti; Timor; Waigeu.

Note. We agree with GÜNTHER when he says of this species l. s. c.: "Founded upon young examples in which the specific characters are not yet developed." Neither in the measurements, the dentition nor the colour there is anything characteristic.

4. Subgenus **Priodonophis** Kaup.

(KAUP, Neue Aalähnl. Fische Hamburg 1859, p. 22).

Height less than 30, head less than 9. At least some of the teeth in upper and lower jaw finely serrated on both edges or posteriorly only.

Artificial key to the indo-australian species of the Subgenus *Priodonophis*.

A. Body with crossbands, which are most distinct on the belly. Tail longer than head and trunk. *M. (P.) reticularis* p. 388.

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1) According to BLEEKER there is an inner pheripheral row of 3 to 4 teeth on the intermaxillary plate. We were unable to find these.

B. Coloration uniform.

a. Tail tapering, longer than head and trunk. *M. (P.) angusticauda* p. 389.

b. Tail scarcely tapering, shorter than head and trunk. . . . . *M. (P.) moluccensis* p. 390.

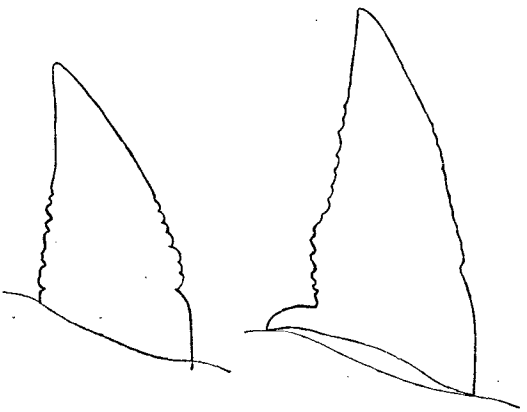

Fig. 190. Two neighbouring teeth of *Muraena (Priodonophis) angusticauda* n. sp.

1. Muraena (Priodonophis) reticularis Bloch.

Gymnothorax reticularis Bloch, Ausl. Fische IX. 1795, p. 85.
Gymnothorax reticulatus Bloch, Ibid. Tab. CCCCXVI.
Gymnothorax reticulatus Bloch, Schneider, System. Ichth. 1801, p. 528.
Muraenophis reticularis Lacépède, Hist. nat. Poiss. V. 1803, p. 628, 642, 643.
Muraena reticulata Richardson, Voyage Erebus & Terror, Fish. 1844, p. 82.
Muraena minor Schlegel, Fauna japon. Poissons II. 1847, p. 269.
Muraena reticulata Kaup, Cat. Apod. Fish. 1856, p. 60.
Muraena minor Bleeker, Verh. Batav. Gen. XXVI. 1854—57, Nieuwe Nalezingen Ichth. Japan p. 123.
Priodonophis minor Kner, Fische Novara-Exp. 1865—1867, p. 382.
Muraena reticularis Günther, Cat. Brit. Mus. VIII. 1870, p. 105.
Priodonophis reticularis Bleeker, Ned. Tijdschr. Dierk. IV. (1871) 1872, p. 124. — Verh. Akad. Amsterdam XVIII. (1877) 1878, Poiss. Japon p. 26.
Muraena reticularis Day, Fish. India 4°. 1878—1888, p. 669.
Gymnothorax reticularis Jordan & Snyder, Proc. U. S. Nat. Mus. XXIII. 1901, p. 882.

Height 23, head 7—8.2, 2.2—2.6 in trunk. Tail about one length of head longer than head and trunk. Eye more than 10, $1\frac{1}{3}$—$1\frac{1}{2}$ in snout, situated somewhat nearer to angle of mouth than to end of snout. Snout scarcely compressed, rather short. Tubes of anterior nostrils very short, about half eye. Gape of mouth 3—3.5 in head. The mouth can be shut completely. Gillopenings as wide as eye. Dorsal rather high, beginning before gillopenings. Maxillary teeth and those in the anterior

part of the lower jaw minutely serrated posteriorly and less distinct anteriorly, provided with a basal lobe. Maxillary teeth in a single series of about 10, compressed, curved backwards, diminishing in size posteriorly. Intermaxillary plate with about 10—14 teeth and 1—3 mesial large depressible canines. Vomer with about 7—10 small teeth in one row. Mandibulary teeth in a single series, about 12—14 on each side. Yellowish or whitish brown, with 15—22 dark crossbands, made up of different brown spots, these mostly turning into black on the belly, where the bands are very distinct. Upper parts everywhere between the bands closely covered with dark brown spots. Length over 550 mm. [Type of *Muraena minor* Schl. in the Leiden Museum seen by us].

Habitat: "Sea of Borneo" (RICHARDSON). — Tranquebar (BLOCH), Formosa, China, Japan.

2. **Muraena (Priodonophis) angusticauda** n. sp.
[Fig. 190, p. 388].

Height 22 behind gillopenings, 27 above anus and rapidly diminishing posteriorly, the tail tapering considerably towards its end. Head and trunk about half length of head shorter than tail. Head 8.4, 2.9 in trunk. Eye nearly 9, about $1^1/_4$ in snout, situated about above the middle of the cleft of the mouth, which goes 2.9 in head. Snout conical, rounded in front. Tube of anterior nostrils much less than half eye, posterior nostrils a longitudinal slit above frontborder of eye, provided with a low rim. Gillopenings somewhat narrower than eye. Dorsal and anal moderately developed, the former beginning before gillopenings. Teeth compressed, with the fore edge and hinder edge finely serrated, the serrations on the hinder edge are much more distinct than those of the fore edge. About 10 teeth in the maxillaries. A peripheral series of about 14 stronger ones on the intermaxillary plate and two more anteriorly, inwards of this row, but no mesial teeth in the single specimen known. Two small teeth on vomer, compressed, but without serrature. Mandibles with one row of about 15 teeth on each side, the foremost much longer than the others and provided with a posterior basal lobe. Colour in alcohol uniform yellowish, belly and fins somewhat lighter. Length of single specimen 489 mm. [Type of the species in the Zoological Museum of Amsterdam].

Habitat: Near Supiori, Schouten Islands!

3. Muraena (Priodonophis) moluccensis Blkr.

Priodonophis moluccensis Bleeker, Ned. Tijdschr. Dierk. II. (1864) 1865, p. 48. — Atl. Ichth. IV. 1864, p. 108.
Muraena moluccensis Günther, Cat. Brit. Mus. VIII. 1870, p. 126.

Height about 20, not much decreasing posteriorly, the tail scarcely tapering towards its end. Head and trunk one length of head longer than tail. Head 8.4, 3.7 in trunk. Eye nearly 12, about twice in snout. Gillopenings wider than eye. Cleft of mouth 2.6 in head. Dorsal and anal rather low, the former beginning somewhat before gillopenings. Teeth compressed, with the hinder edge finely serrated. Maxillaries with a single series of about 15 teeth, increasing in size anteriorly. A peripheral series of about 9 stronger teeth on intermaxillary plate and a single mesial one. Teeth on vomer small, without serrations, anteriorly in a double, posteriorly in a single series. Mandibles with about 25 teeth on each side, uniserial, but less regularly arranged towards the symphysis. Uniform brown. Length of single specimen known 395 mm. [Type of the species in the British Museum seen by us].

Habitat: Ambon!.

5. Subgenus **Enchelynassa** Kaup.

(Kaup, Cat. Apodal Fish 1856, p. 72).

Anterior nostrils at some distance of end of snout, with a low thickened rim and a posterior bilobed flap, posterior nostrils situated midway between anterior nostrils and eye, oval, not much smaller than eye, surrounded by a broad, thin membrane. Height less than 30. Teeth without serrature.

1. Muraena (Enchelynassa) canina Q. G.

Muraena canina Quoy & Gaimard, Voyage de l'Uranie et la Physicienne, Zoologie 1824, p. 247.
Enchelynassa Bleekeri Kaup, Cat. Apod. fish 1856, p. 72.
Gymnothorax caninus Bleeker, Ned. Tijdschr. Dierk. II. 1865, p. 136.
Gymnothorax Bleekeri Bleeker, Ibid. p. 136.
Enchelynassa bleekeri Günther, Cat. Brit. Mus. VIII. 1870, p. 136.
Gymnothorax vinolentus Jordan & Evermann, Bull. U. S. Fish. Comm. XXII. (1902) 1904, p. 165.
Enchelynassa bleekeri Jordan & Evermann, Bull. U. S. Fish. Comm. XXIII. (1903) 1905, p. 90.
Enchelynassa vinolentus Jordan & Evermann, Ibid. p. 91.

Enchelynassa canina Jordan & Seale, Bull. Bur. Fisheries Washington XXV. (1905) 1906, p. 197.

Muraena bleekeri Günther, Fische der Südsee, Heft IX. 1910, p. 409.

Height 14; head swollen, 7.4, 2.9 in trunk. Tail one third of length of head shorter than head and trunk. Eye more than 10, situated nearer to end of snout than to corner of mouth. Cleft of mouth more than twice in length of head, not closing: only the tips of the jaws meet. Gillopenings funnel-shaped, smaller than eye. Dorsal and anal rather low, the former beginning somewhat before gillopenings. Maxillary teeth in 2 series, the outer series close set, compressed large teeth, the most anterior small; the inner series shorter, consisting of large depressible fangs. On the intermaxillary plate the outer maxillary series is continued as a series of very small teeth mingled with large ones, especially at the frontborder; it carries besides two large median depressible fangs and more posteriorly on each side a pair of similar fangs. On the vomer two small conical teeth. In the mandibles an outer series of numerous large teeth, getting small anteriorly and near symphysis a short inner series of large depressible fangs. Nearly uniform darkish brown. Length 1300 mm. [Description made after the type of *Enchelynassa bleekeri* Kaup in the Leiden Museum].

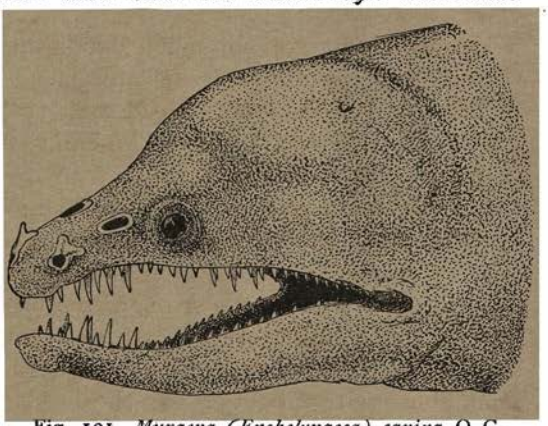

Fig. 191. *Muraena (Enchelynassa) canina* Q. G. (After the type of *Enchelynassa bleekeri* Kaup).

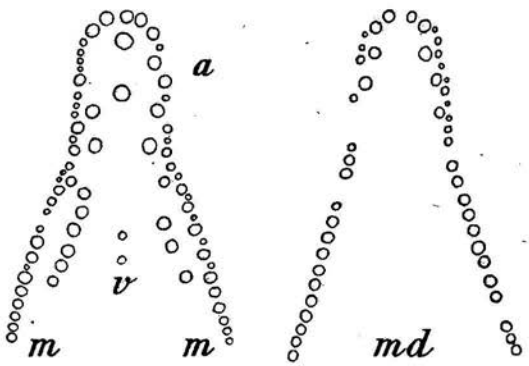

Fig. 192. Dentition of *Muraena (Enchelynassa) canina* Q. G. × 1¼. *a* intermaxillary, *m* maxillary, *md* mandibulary, *v* vomerine teeth. (After the type of *Enchelynassa bleekeri* Kaup).

Habitat: Waigeu and Island Rawak [QUOY & GAIMARD]. — Samoa, Tahiti, Raiatea, Hawaii.

Note: JORDAN & SEALE (l.s.c.) have united *Muraena canina* of QUOY & GAIMARD (l. s. c.) with *Enchelynassa Bleekeri* Kaup. Notwithstanding the description of QUOY & GAIMARD is insufficient, we follow JORDAN & SEALE in their interpretation, because the french authors say about the nostrils: "narines tubulées". It is clear that they mean by "narines" the posterior nostrils, for from their descriptions of other species of *Muraena* it appears, that they knew the tubes of the anterior nostrils, but did not recnognise them as such. They use the name "narines" only for the posterior nostrils. Moreover their description of the dentition, of the head as "capite crasso", of the colour as "uniformément noirâtre" makes it plausible, that the opinion of JORDAN & SEALE is right.

5. Gymnomuraena Lacépède.

(LACÉPÈDE, Hist. Nat. Poissons V. 1803, p. 648).

Uropterygius Rüppell; *Scuticaria* Jordan & Snyder; *Anarchias* Jordan & Seale.

Elongate or very elongate, rounded or somewhat compressed. Eye small, covered by skin. Anterior nostrils in a conspicuous

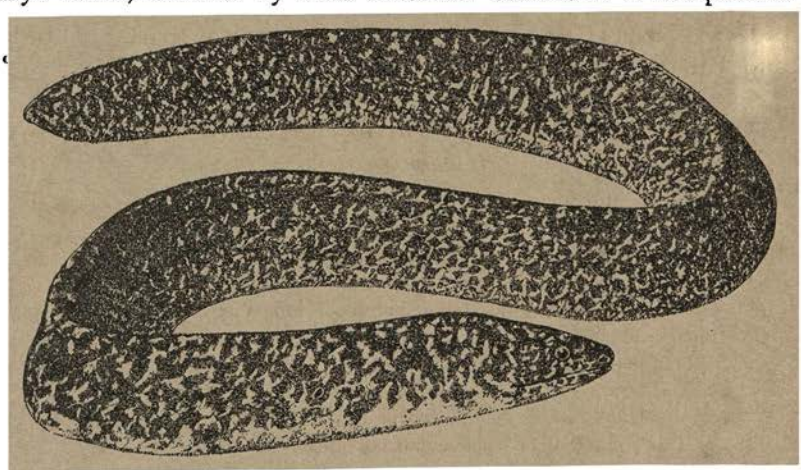

Fig. 193. *Gymnomuraena marmorata* Lacép. × 4/5.

tube, posterior nostrils in a shorter or longer tube or with a rim only. Cleft of mouth reaching behind eye, closing completely or nearly so. Pectorals absent. Dorsal and anal reduced

to a rudiment, which is confluent with the caudal; in some individuals the dorsal may be represented by a more or less conspicuous fold of the skin. Tail equal to, shorter or longer than head and trunk. Maxillary and mandibulary teeth in 2 or 3 series, an outer series of numerous, sessile, compressed, smaller teeth, close together and 1 or 2 inner series of less numerous teeth, which are longer and depressible. The outer maxillary series is continued on the intermaxillary plate and encloses numerous, irregularly placed longer teeth, which are depressible. Vomer with one or two series of pointed teeth. Gillopenings small in the middle of the height of the body or above or below it.

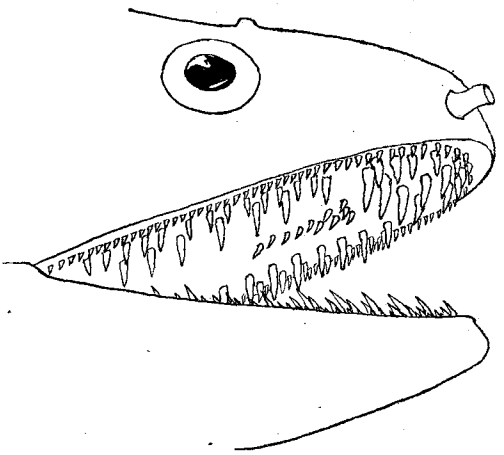

Fig. 194. Dentition of *Gymnomuraena marmorata* Lacép.

Distribution: Tropical and subtropical parts of Indic and Pacific. On coral reefs and near shore.

Artificial key of the indo-australian species of *Gymnomuraena*.

I. Tail 1 3/4 to more than twice in length of head and trunk . . . . . *G. tigrina* p. 393.
II. Tail equal to, somewhat shorter or somewhat longer than head and trunk.
A. Colour uniform brown; tail equal to or longer than head and trunk. . . . . *G. concolor* p. 395.
B. Colour marmorated or mottled.
a. Tail equal to or somewhat shorter than head and trunk; head 7—7.5 in length. . . . . *G. macrocephalus* p. 396.
b. Tail longer than head and trunk; head less than 9 to 11 in length. . . . . *G. marmorata* p. 397.

1. Gymnomuraena tigrina (Less.).

Ichthyophis tigrinus Lesson, Mém. Soc. Hist. Nat. Paris IV. 1828, p. 399. — Voyage Coquille Zool. II. 1830, p. 129.

Ichthyophis tigrinus Richardson, Zoology Voyage Erebus & Terror, 1844, p. 96.
Muraenoblenna tigrina Bleeker, Act. Soc. Sc. Indo-Neerl. II. 1857, Achtste Bijdr. vischf. Ambon p. 93 [1]).
Ichthyophis tigrinus Bleeker, Versl. Akad. Amsterdam XV. 1863, p. 463.
Gymnomuraena tigrina Bleeker, Atl. Icht. IV. 1864, p. 113.
Gymnomuraena tigrina Günther, Cat. Brit. Mus. VIII. 1870, p. 133.
Scuticaria tigrina Jordan & Evermann, Bull. U. S. Fish. Comm. XXIII (1903) 1905, p. 112.
Gymnomuraena tigrina Günther, Fische der Südsee, Heft IX. 1910, p. 424.

Height 27—30; head 12—13 1/2, 6.4—7.8 in trunk. Tail 1 3/4 to more than twice in head and trunk. Eye more or less than 15, situated above the middle of the cleft of the mouth, which goes 3 times or somewhat more in length of head, is horizontal and shuts completely. Snout somewhat rounded, 7 times in head and more than twice length of eye. Anterior nostrils in a conspicuous tube, somewhat longer than the tube of the posterior nostrils. Gillopenings smaller than eye, about in the middle of the height. Maxillary teeth with an outer series of smaller teeth and a much shorter inner series of longer and depressible teeth; the outer series continued on the intermaxillary plate and enclosing some large, depressible teeth. On vomer 2 or 3 large teeth in a single series. Mandibles anteriorly with 2, posteriorly with 1 series of teeth. Reddish brown with numerous larger and smaller black blotches. Length about 1200 mm. [A specimen of BLEEKER's collection seen by us]. Habitat: Java (Prigi); Cocos Islands; Celebes; Ambon; Timor. — From Red Sea, East coast of Africa and Mauritius to Sandwich Islands.

Note. KNER (Novara-Exp. Fische, p. 387) gives a description of a fish from Tahiti, which he calls *Gymnomuraena tigrina*, but which can not be the present species, as KNER states that head and trunk are about equal to tail. DAY's *G. tigrina* (Fishes of India 4°. 1878—1888, p. 674) must also be an other species, as he says: "Tail nearly twice as long as body". This may however be a misprint. It may be noted here that BLEEKER makes a similar mistake in his Atlas Ichthyologique, where *G. tigrina* is characterized in the key by: "Queue beaucoup plus longue que le tronc". In the "remarques" following on

1) BLEEKER has shown (Versl. Akad. Amsterdam XV. 1863, p. 462) that KAUP has confounded *Gymnomuraena marmorata* and *Gymnothorax polyuranodon* under this name.

the diagnosis he also says that this species is characterized by: "la queue, qui est beaucoup plus longue que le tronc". In his diagnosis however it is clear that the reverse is meant.

2. Gymnomuraena concolor (Rüpp.).

Uropterygius concolor Rüppell, Neue Wirbelth. Fische 1835, p. 83.
Gymnomuraena fusca Peters, Monatsber. Akad. Berlin (1866) 1867, p. 524.
Gymnomuraena concolor Günther, Cat. Brit. Mus. VIII. 1870, p. 134.
Gymnomuraena fusca Günther, Ibid. p. 134.
Gymnomuraena concolor Klunzinger, Abh. Zool. botan. Ges. Wien XXI. 1871, p. 620.
Uropterygius marmoratus Snyder, Bull. U. S. fish. Comm. XXII. (1902) 1904, p. 521 (nec Lacépède).
Uropterygius concolor Jordan & Seale, Proc. U. S. Nat. Mus. XXVIII. 1905, p. 772. — Bull. Bureau fisheries Washington XXV. (1905) 1906, p. 206.
Anarchias allardicei Jordan & Seale, Bull. Bureau fisheries Washington XXV. (1905) 1906, p. 205.
Muraena allardicei Günther, Fische der Südsee, Heft IX. 1910, p. 421 (s. syn.).
Gymnomuraena concolor Günther, Ibid. p. 426.
Uropterygius concolor Kendall & Goldsborough, Mem. Mus. Harvard College XXVI. 1911, N°. 7, p. 250.
Gymnomuraena concolor Max Weber, Siboga-Expeditie, Fische 1913, p. 63.
Anarchias allardicei de Beaufort, Bijdrage Dierkunde Aflev. 19, 1913, p. 101 (s. syn.).

Height 20 to about 33; head between 7.1—8.4, 2.4 to nearly 3 in trunk. Head and trunk equal to or shorter than tail, this may be as much as half or more than half length of head [1]). Eye 10—12, situated above about the middle of the cleft of mouth, which goes 2.6—3.4 in length of head, is horizontal and shuts completely or nearly so. Snout blunt, rounded, 5.8 to more than 6 times in length of head. Anterior nostrils in a conspicuous tube, posterior nostrils with an elevated rim at least in our

1) In our specimens the length of head, trunk and tail are as follows:

13.5	—34.5	— 50	}	gillopenings below middle of the height.
13	—35	— 50		
13	—37	— 50		
15.5	—38.5	— 56		
16	—42	— 58		
15	—42	— 59		
15	—35	— 62		
16	—43	— 77	}	gillopenings in middle of the height.
23	—72	— 95		
24	—70	—101		
23	—63	—112		
32	—84	—145		

largest specimen. Gillopenings somewhat smaller than eye, in small specimens (see note on page 395) below middle of height, later on in middle of height. Maxillary and mandibulary teeth in 2 series, an outer series of numerous sessile, compressed, smaller teeth, close together, and an inner series of less numerous but much longer teeth, which are depressible. The outer maxillary series is continued on the intermaxillary plate, but these teeth are smaller and enclose numerous, irregularly placed depressible teeth, which are longer, especially the hinder ones. Vomer with a short single series of about 6 pointed teeth. Preserved specimens uniform brown. Rudimentary fins near point of tail often yellowish. Length 500 mm. [1]).

Habitat: Nias!; Kabala dua near East Borneo!; Ambon!; Nusa Laut!; Island Kur!; Island Savu!; Island Solor!; New Guinea: Humboldt Bay!; Mysore (Schouten-Islands). — Red Sea; Mauritius; Philippines; Cape York; Australia; West Pacific Islands to Sandwich and Society Islands.

Note. Our impression is that *G. concolor* is characterized by its uniform brown colour and by its tail, which is equal to or much longer than head and trunk. We have at our disposal a specimen from the mouth of Mbai river, Humboldt Bay, New Guinea, of 158 mm., which has the uniform brown colour of *G. concolor*, but its tail is shorter than head and body; the measurements are: head 19, trunk 63, tail 76. We are not sure where to place this specimen, the dentition of which agrees with that of *G. concolor* or of the young of *G. marmorata.*

3. Gymnomuraena macrocephalus Blkr.

Gymnomuraena macrocephalus Bleeker, Ned. Tijdschr. Dierk. II. (1864) 1865, p. 54. — Atl. Ichth. IV. 1864, p. 114.
Gymnomuraena marmorata Günther, Cat. Brit. Mus. VIII. 1870, p. 133 (p. p.).
Gymnomuraena macrocephalus Günther, Fische d. Südsee, Heft IX. 1910, p. 425.
Gymnomuraena tigrina M. Weber, Siboga-Expeditie, Fische 1913, p. 63.

Height about 20; head 7—7.5, 2.8—3 in trunk. Head and trunk equal to or somewhat longer than tail. Eye 11—15, situated above about the middle of the cleft of the mouth, which goes 2.5 to 3 times in length of head, is horizontal and shuts completely. Snout bluntly rounded, about 7 times in

1) According to RÜPPELL one of his specimens of 271 mm. "hatte im Monate März seine Bauchhöhle mit stark entwickelten Eiern gefüllt."

length of head. Anterior nostrils in a short tube; posterior nostrils with an elevated rim. Gillopenings about as wide as the eye, situated below middle of height. Maxillary and mandibulary teeth in 2 series, an outer series of numerous sessile, compressed, smaller teeth, close together, and an inner series of less numerous but much longer teeth, which are depressible. The outer maxillary series is continued on the intermaxillary plate but the anterior of these teeth are somewhat smaller and enclose numerous irregularly placed depressible teeth, which are longer. Vomer with a short single series of rather long, pointed teeth. Lighter or darker brown, mottled with yellowish or with light points. Length 325 mm.

Habitat: Muaras Reef, east coast of Borneo!; Karakelang-Islands!; Ambon. — Marquesas Islands; Samoa.

4. **Gymnomuraena marmorata** Lac. [Fig. 193, 194, p. 392, 393].

Gymnomuraena marmorata Lacépède, Hist. Nat. Poissons V. 1803, p. 648.
Ichthyophis pantherinus Lesson, Voyage Coquille Zool. II. 1830, p. 131.
Muraena micropterus Bleeker, Nat. Tijdschr. Ned. Indië III. 1852, p. 298. — Verh. Bat. Gen. XXV. 1853, Muraenoiden p. 50.
Muraeno-blenna tigrina Kaup, Cat. Apodal Fish 1856, p. 98 (pro parte).
Uropterygius xanthopterus Bleeker, Nat. Tijdschr. Ned. Indië XIX. 1859, p. 350.
Uropterygius micropterus Bleeker, Ned. Tijdschr. Dierk. I. 1863, p. 160.
Ichthyophis micropterus Bleeker, Ibid. p. 252.
Ichthyophis pantherinus Bleeker, Versl. Akad. Amsterdam XV. 1863, p. 464.
Gymnomuraena pantherina Bleeker, Atl. Ichth. IV. 1864, p. 113.
Gymnomuraena xanthopterus Bleeker, Ibid. p. 114.
Gymnomuraena micropterus Bleeker, Ibid. p. 114.
Gymnomuraena microptera Kner, Fische Novara-Exp. 1865—1867. p. 388.
Gymnomuraena xanthoptera Kner, Ibid. p. 388.
Gymnomuraena marmorata Günther, Cat. Brit. Mus. VIII. 1870, p. 133 (p. p.).
Gymnomuraena marmorata Day, Fishes of India 4°. 1878—1888, p. 675.
Uropterygius marmoratus Jordan & Evermann, Bull. U. S. Fish. Comm. XXIII. (1903) 1905, p. 111.
Gymnomuraena marmorata Günther, Fische der Südsee, Heft IX. 1910, p. 425.
Uropterygius pantherinus Kendall & Goldsborough, Mem. Mus. Harvard Coll. XXVI. N°. 7, 1911, p. 248.
Uropterygius marmoratus Kendall & Goldsborough, Ibid. p. 250.
Gymnomuraena marmorata Max Weber, Siboga-Exp. Fische 1913, p. 62.

Height 19—26; head less than 9 to about 11; 3—4 times in trunk. Head and trunk 1.2 or somewhat more in tail; tail in small specimens more than half length of head, in larger specimens the length of head or even more, longer than head and trunk. Eye 10—18, situated above about the middle of

the cleft of mouth, which goes $2^1/_2$ to 3 times in the length of head, is horizontal and shuts completely. Snout somewhat rounded, about 7 times in length of head and nearly twice or more than twice the length of eye. Anterior nostrils in a conspicuous tube, posterior nostrils in youth with a rim, later on in a short tube. Gillopenings smaller than eye, about in the middle of the height. Maxillary and mandibulary teeth in 3 series: an outer series of numerous sessile, compressed, smaller teeth, close together, and 2 inner series of less numerous teeth, which are longer and depressible; in young specimens there are only 2 series. The outer maxillary series is continued on the intermaxillary plate and encloses numerous, irregularly placed, longer depressible teeth. Vomer with a short row of pointed teeth, anteriorly biserial, posteriorly uniserial, in young ones in one series. Yellowish, brownish or brownish gray, lighter below, finely or coarsely marbled with darker. Length over 600 mm. [A specimen of *Gymnomuraena pantherina* of BLEEKER's collection in the Leiden Museum seen by us].

Nom. indig.: Sawali lasavun (Simalur).

Habitat: Sumatra (Benkulen); Nias!; Simalur!; Java (Batavia!, Patjitan, Wijnkoops Bay!); Paternoster Islands!; Flores; Solor; Timor; Letti Islands!; Aru Islands; Celebes (Dongala!); Muaras Reef!; Sangir Islands!; Buru; Sula Islands!; Ambon!; Ceram; Ternate; Halmaheira; Morotai; Waigeu; New Guinea (Tanah merah!). — Zanzibar; Aldabra Island; Madras; Andamans; Philippines; Pacific Islands to Sandwich Islands.

LARVAL STAGES OF APODES. LEPTOCEPHALI.

We know, at least of a number of genera of *Apodes (Anguilla, Conger, Congromuraena, Muraena, Chlopsis, Ophisurus, Ophichthys, Nettastoma, Synaphobranchus)*, that they undergo during their development a metamorphosis passing through different larval stages known as *Leptocephalus, Tilurus, Hyoprorus*.

It is probable that, if not all, at least the majority of the *Apodes* pass through such a metamorphosis, although this metamorphosis may not be everywhere as complicated as f.i. in the atlantic species of *Anguilla*.

The interesting development of these species, first made

known by GRASSI and CALANDRUCCIO, has further been studied by EIGENMANN, PETERSEN, JOH. SCHMIDT, HJORT a.o.

We may presume that the indo-pacific species of *Anguilla* have an equal life history, as during the Siboga-Expedition a large number of *Leptocephali* in different stages of development were collected, some of which belong probably to the genus *Anguilla*. The systematic position of others is still questionable.

These forms are here shortly described; for further details we refer to the descriptions in: Max Weber, Siboga-Expedition, Fische, 1913, p. 63—78.

Leptocephali possibly belonging to Anguilla.

1. Leptocephalus indicus M. Web.

Leptocephalus indicus Max Weber, Siboga-Exp. Fische 1913, p. 74.

Description of the single specimen known with 115 segments:

Length 115 mm.; height 14 mm.; head 5 mm.; distance of anus from tip of tail 34 mm., eye 1.3 mm., snout 1.2 mm., posttemporal part of head 2.5 mm.

Height 8, head 23, tail 3.4 in total length. Eye 3.8, slightly longer than snout and about twice in posttemporal part of

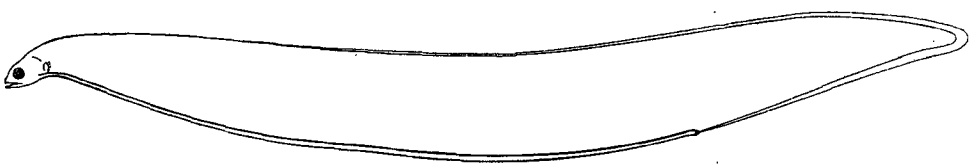

Fig. 195. *Leptocephalus indicus* M. Web. nearly nat. size.

head. Snout somewhat rounded. Gape of mouth reaching behind middle of eye. Anus below 73rd segment, $2^1/_3$ times farther from head than from tip of tail. No larval teeth. From the definitive teeth, which are very small at any rate, only a few at the frontborder of the upper jaw could be detected. Pectorals rounded, small. Dorsal and anal with about 100, caudal with 15 rays. In the last third of the length each myocomma has 6—8 pigment spots on that part of the myocomma, which is situated between its most ventral part and the chorda. Moreover a pigment spot on the base of each dorsal, caudal and anal ray.

The single specimen was captured in the deep sea trawl, hauled up from a depth of 1270 M., in the Sulu Sea, 6° 15′ N., 120° 21′ E.!

2. Leptocephalus peterseni M. Web.

Leptocephalus Peterseni Max Weber, Siboga-Exp. Fische, 1913, p. 72.

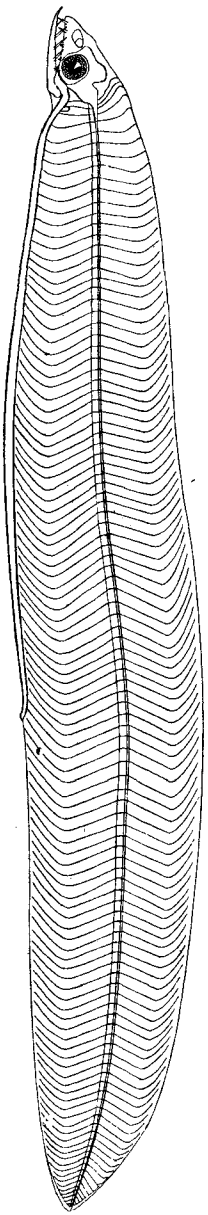

Fig. 196. *Leptocephalus peterseni* M. Web. of 20 mm. length. × 8.

1. Stage with 112 segments. Length 20 mm.

Height 6.5, head 13.5. The anus is $1^1/_2$ length of head nearer to tip of tail than to head. 60 praeanal, 52 postanal segments. Eye about $3^1/_2$, shorter than postorbital part of head and $1^1/_2$ in snout. In the upper jaw on each side anteriorly two long teeth and posteriorly 3 small ones. In the lower jaw on each side 6 long

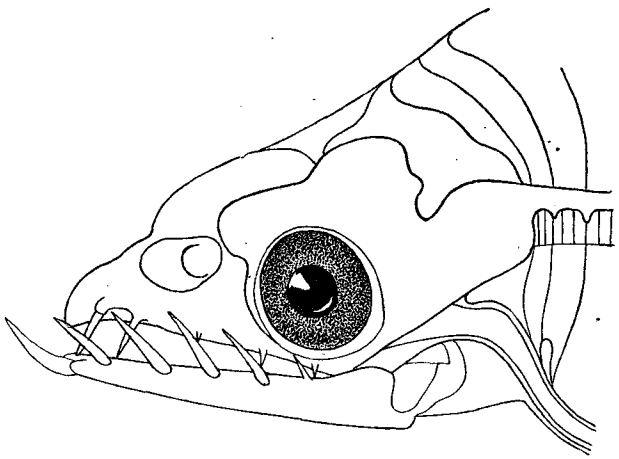

Fig. 197. Head of *Leptocephalus peterseni* M. Web. of 20 mm. length. × 40.

teeth, the hindermost of which alone is somewhat shorter. Cleft of mouth reaching somewhat behind the middle of the eye. A very low, rayless finfold at the end of the tail. No pectorals. A single specimen from the Savu sea, between Timor and Lomblem, captured with HENSEN's "Horizontal cylinder", during the night!

2. Stage with 140 segments. Length 38 mm.

Height about $7^1/_2$, head $15^1/_2$. Anus $3^1/_2$ lengths of head nearer to tip of tail than to

head, 80 praeanal, 60 postanal segments. Eye about 4, $1^1/_3$ in postorbital part of head and $1^3/_4$ in snout. Cleft of mouth reaching somewhat behind the middle of the eye. Olfactory pit with a smaller anterior and a larger posterior nostril imme-

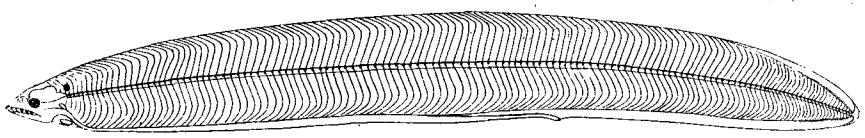

Fig. 198. *Leptocephalus peterseni* M. Web. of 38 mm. length. × 3.

diately before the eye. Dentition as in the former stage. Pigment spots without any segmental arrangement along the dorsal and ventral border of the body, as also in a single row along

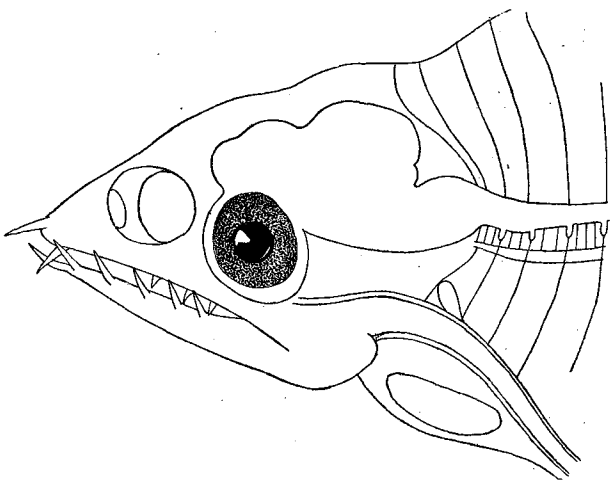

Fig. 199. Head of *Leptocephalus peterseni* M. Web. of 38 mm. length. × 24.

the ventral side of the spinal chord. Rays in the finfold at the end of the tail present, but still too small to be counted.

A single specimen from the Halmahera sea, near the north-coast of Island Salomakieë (Damar!). Surface plankton.

Leptocephalus possibly belonging to Muraenesox.

Leptocephalus schmidti M. Web.

Leptocephalus Schmidti Max Weber, Siboga-Exp. Fische, 1913, p. 74.

Description of the single specimen known, with 135 segments: Length 83 mm. Height 10 mm.; head 5.5 mm.; distance of

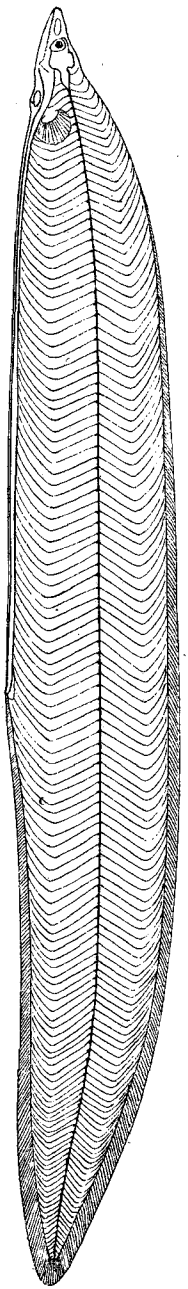

Fig. 201. *Leptocephalus schmidti* M. Web. of 83 mm. length. × 2.

anus from end of tail 38 mm., from point of snout 45 mm. Eye 1 mm., postorbital part of head 2.5 mm., snout 2 mm.

Height 8.3, head 16 in length, eye telescopic, 5.5 in head, twice in snout, 2.5 in postorbital part of head. Snout elongate, pointed, with an elongate oval olfactory pit. Cleft of mouth reaching far behind eye. In upper jaw on each side about 11 pointed teeth, in the lower jaw 10, the six anterior ones of which are larger. All teeth are directed forwards. Anus nearly in the middle between tip of tail and gillopenings.

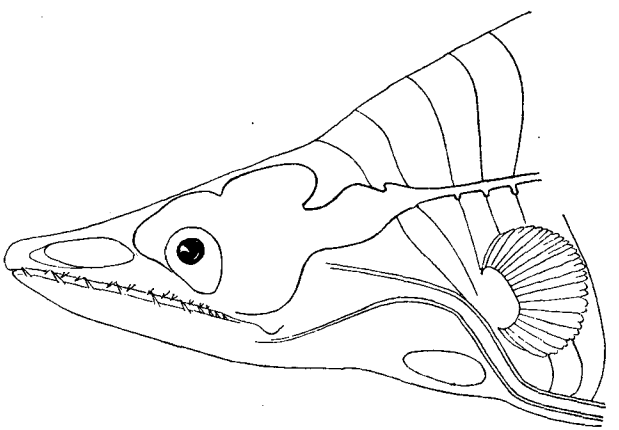

Fig. 200. Head of *Leptocephalus schmidti* M. Web. of 83 mm. length. × 9.

The relatively high finfold begins at the anus and runs round the end of the tail forward to a vertical, which is situated behind the hind-border of the pectorals, at a distance equal to the breadth of the pectorals. Anal with 202, caudal with 9, dorsal with 253 rays. Pectorals with about 18 rays. Surface plankton, bay of Bima!

Leptocephali, the adult stage of which is unknown.

1. Leptocephalus hjorti M. Web.

Leptocephalus Hjorti Max Weber, Siboga-Exp. Fische, 1913, p. 71.

Description of the single specimen known with 144 segments: Length 195 mm. Height 30 mm. Head 7 mm. Distance of anus from end of tail 29 mm. Snout 2, eye 2, postorbital part of head more than 3 mm. Dorsal with about 90, anal with about 93, caudal with 14 rays; these three fins form a continuous low fold. Pectorals rounded, much shorter than eye,

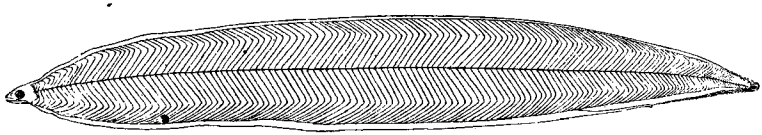

Fig. 202. *Leptocephalus hjorti* M. Web. of 195 mm. length; nearly × $1^1/_2$.

with 12—15 rays. Head pointed. The gape of the mouth reaches behind the middle of the eye. The larval teeth have already been lost. In their place very tiny teeth, mixed with a few somewhat larger ones, can be seen in the jaws. Nostrils rather close together before the eye, the posterior ones the larger.

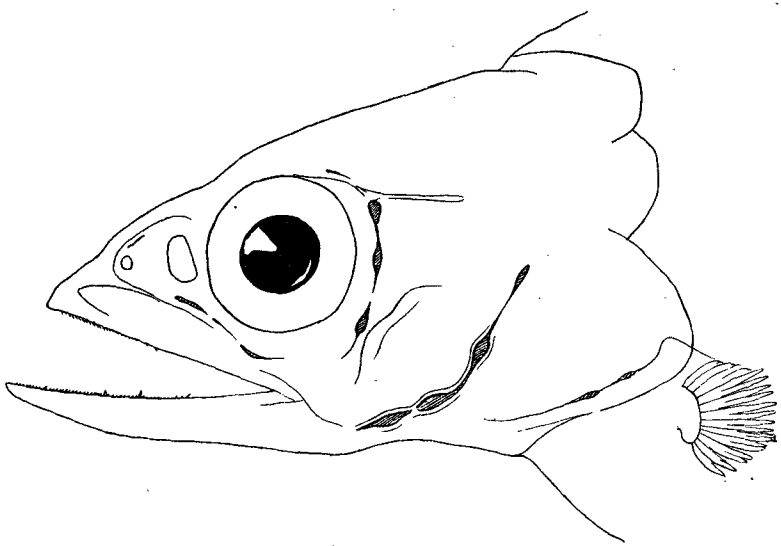

Fig. 203. Head of *Leptocephalus hjorti* M. Web. of 195 mm. length. × 12.

The presence of pectorals, of sensory canals on the head, the development of the olfactory pit and the loss of larval teeth show that the specimen belongs to the last metamorphosing stage before becoming a glass-eel.

Habitat: The single specimen known was captured with the deep-sea trawl, hauled up from a depth of 1944 M. Banda sea, 5° 26′ S., 121° 18′ E.!

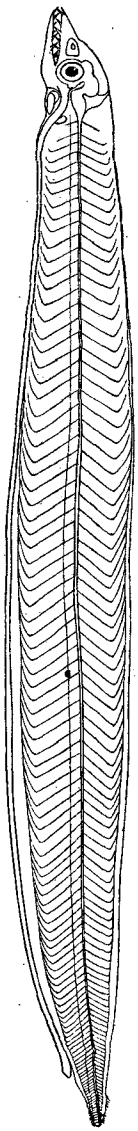

Fig. 205. *Leptocephalus taenia* Less. of 19.5 mm. length × 8.

2. Leptocephalus taenia Less.

Leptocephalus taenia Lesson, Voy. Coquille, Zoologie II. 1830, p. 126.
Leptocephalus taenia Kaup, Cat. Apodal Fish 1856, p. 151.
Leptocephalus Schéeli Strömman, Leptocephalids of the University Zoolog. Museum at Upsala. Dissertatio Upsala 1896, p. 21.
Leptocephalus taenia Max Weber, Siboga-Expeditie, Fische 1913, p. 67.

1. Stage with 106 segments. Length 19.5 mm.

Height 2 mm.; head 1.75 mm.; distance of anus from end of tail about 1 mm., from head 16.75 mm.

Height 9.7; head 11; tail 19.5 times in total length. Snout pointed, part of head behind it convex. Eye more than twice in snout, cleft of mouth reaching frontborder

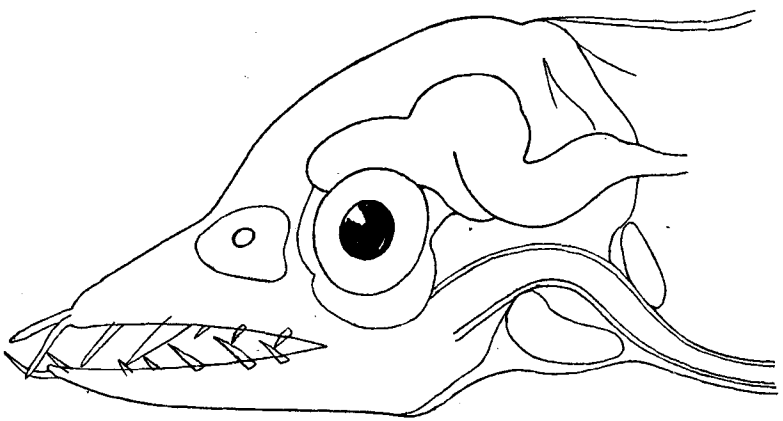

Fig. 204. Head of *Leptocephalus taenia* Less. of 19.5 mm. length. × 45.

of eye. Seven pointed larval teeth on each side in the jaws, of which the 3 posterior ones in the upper jaw are conspicuously smaller. End of tail surrounded by very delicate fin rays. Absolutely without pigment, only an incomplete black ring in the periphery of the chorioidea.

The single specimen found in surface plankton near Island Sailus Ketjil, Paternoster Islands!

2. Stage with about 115 segments and more than 7 teeth on each side of the jaws. Length 56—124 mm.

Anus near end of tail; their distance being $^1/_{18}$—$^1/_{20}$ of total length. Elongate, height 8—10; head 22—32. Head somewhat pointed, with large olfactory pit situated before the eye, which goes about $4^1/_4$ times in length of head, and is much smaller than its postorbital part and about half length of snout. Cleft of mouth reaching to middle of eye or somewhat farther back. Upper jaw on each side with 13 pointed teeth, the 7 anterior

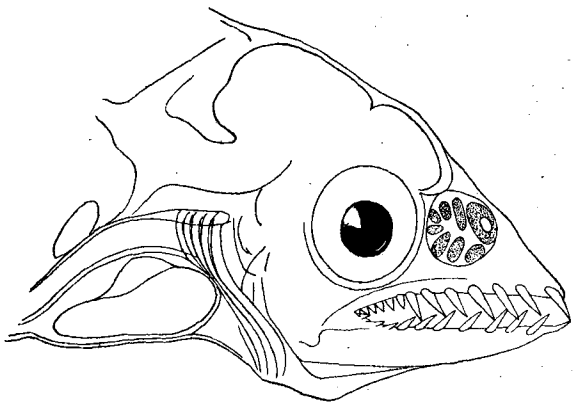

Fig. 207. Head of *Leptocephalus taenia* Less. of 102 mm. length. × 15.

ones being much longer than the 6 posterior ones, which are decreasing in size posteriorly and become more triangular. Lower jaw on each side with 11 teeth, the 7 anterior ones being conspicuously longer than the 4 posterior ones, which are short, triangular and very obliquely placed. Dorsal and anal with about 50, caudal with 8 rays. These fins form a continuous low fold. Pectorals still only vestigial. The pigmentation is restricted to a series of black points on part of the ventral half of the myocommata, on the interspaces between neighbouring finrays, on the ventral surface of the kidney, in the connective tissue ventrally from the gut as also along the dorsal and anal.

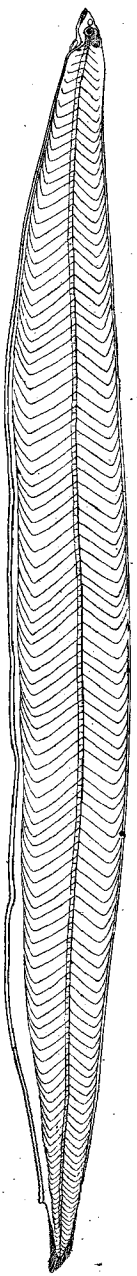

Fig. 206. *Leptocephalus taenia* Less. of 110 mm. length. ca. × $1^1/_2$.

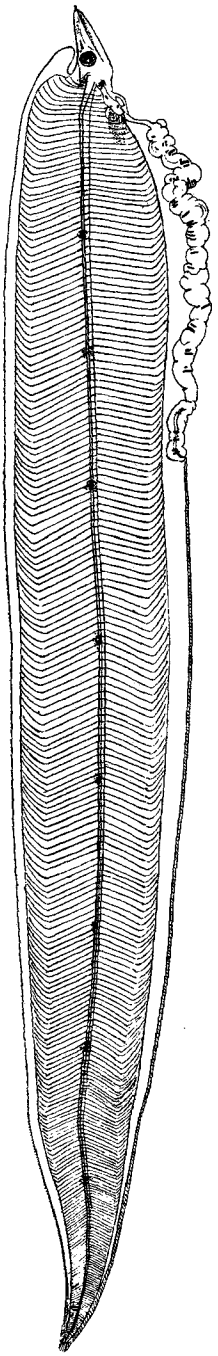

Fig. 208. *Leptocephalus mirabilis* Brauer of 143 mm. length. × 1.26.

A specimen of 90 mm. from surface plankton, Island Sebangkatan, Borneo Bank!.

20 specimens of 56—110 mm. from surface plankton, 2° 30′ S., 129° 28′ E., Ceram Sea!.

One specimen of 77 mm. surface plankton, 2° 22′ S., 126° 46′ E. Ceram Sea!.

4 specimens of 98—102 mm, surface plankton, Banda Sea near Lucipara Islands!.

7 specimens of 63—124 mm., surface plankton, 4° 16′ 5″ S., 130° 15′ 8″ E. Banda Sea!.

One specimen caught in vertical net, hauled up from 2000 M. depth, 3° 58′ S.; 128° 20′ E. Banda Sea!.

For further details see MAX WEBER l.s.c.

3. **Leptocephalus mirabilis** Brauer.

Leptocephalus mirabilis Brauer, Deutsche Tiefsee Exp. Tiefseefische I. 1906, p. 125.

Leptocephalus mirabilis Max Weber, Siboga-Exp. Fische, 1913, p. 76.

Description of a specimen with 293 segments:

Length 143 mm.; head 8 mm.; eye 1.5 mm.; snout 4.5 mm.; height immediately behind anus 20 mm.; in the region of the gut 23 mm. Distance of anus from point of snout 49 mm., from end of tail 96 mm. In the upper jaw on each side 12 anterior larger, and 8 posterior smaller teeth; in the lower jaw 20 teeth, the posterior ones of which gradually become smaller, the most anterior one is nearly horizontal, that in the upper jaw only slightly oblique. Cleft of mouth reaching below middle of eye. Only the posterior nostrils are with certainty descernible as narrow triangular clefts, the base of which is situated superiorly near the frontborder of the eye. Dorsal with more than 300 rays. Dorsal and anal continuous with caudal. Pectorals present. Dorsal part of anterior myomeres very high, making the trunk anteriorly and

superiorly gibbous. This gibbosity is enlarged by the excessive development of the extra-muscular gelatinous connective tissue, which forms, immediately behind the head, a kind of strongly compressed rounded lobe overhanging the posterior part of the head. The gut is suspended like a frill on the under side of the anterior third of the body. The small gillopenings are

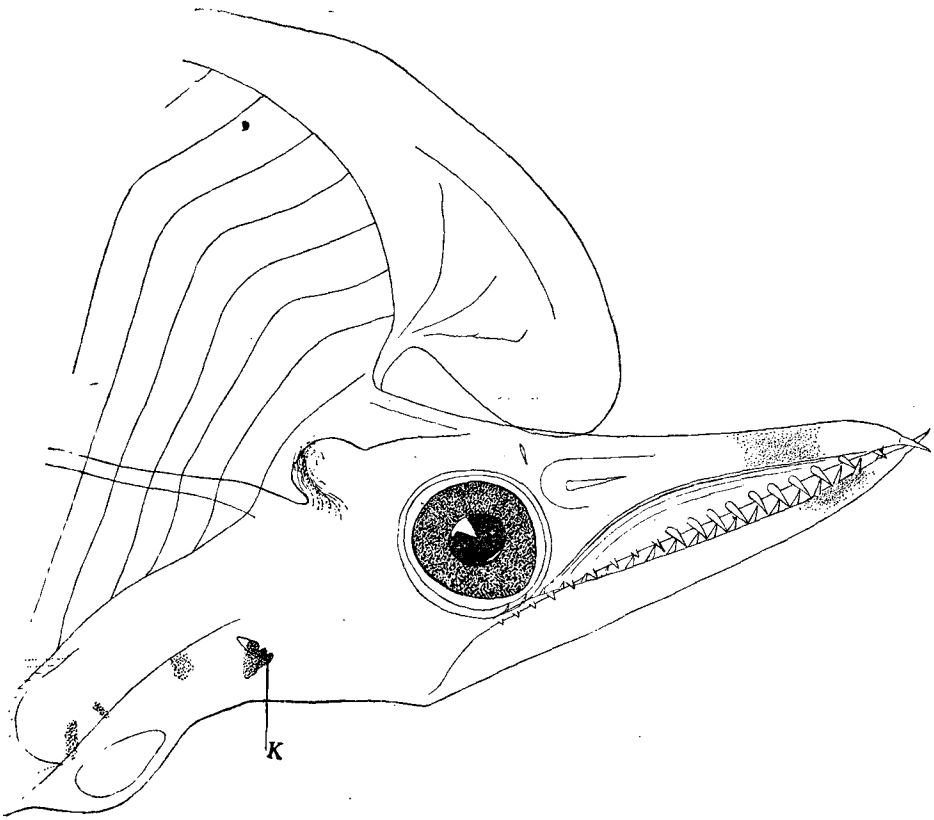

Fig. 209. Head of *Leptocephalus mirabilis* Brauer of 143 mm. length. K gillopening.

situated ventrally. Eight laterally situated dark patches, formed by submuscular chromatophores; irregular pigment spots along the gut, a diffuse pigment spot near the end of te upper and lower jaw.

The single specimen was captured in the deep sea trawl, hauled from a depth of 2477 M. in the Banda Sea, 6° 40′ 6″ S., 123° 14′ 7″ E.!

We suppose that this specimen is a further advanced stage of the *Leptocephalus mirabilis* described by BRAUER after a specimen of 71.5 mm. from the Indian Ocean, east of Zanzibar.

Besides the above described forms the following *Leptocephali* have been mentioned from the indo-australian Archipelago.

Their description is so short or insufficient, that we draw the attention on them only for completness sake.

1. Leptocephalus dentex Cantor.

Leptocephalus dentex Cantor, Journ. Asiat. Soc. Bengal XVIII. (1849) 1850, p. 1315.

Described after a specimen of $4^1/_2$ inches length from Pinang, found in the stomach of *Johnius diacanthus*.

2. Helmichthys oculus Peters.

Helmichthys oculus Peters, Monatsber. Akad. d. Wissensch. Berlin, 1866, p. 525.
Helmichthys oculus Max Weber, Siboga-Exp. Fische, 1913, p. 65.

It follows from the description of PETERS that this Leptocephalid of 157 mm. length from Ambon was in the regressive metamorphosis to a glass-eel, the body of which was already beginning to be rounded. It may be that it is a larval stage of *Congrellus* Ogilby or *Paramyrus* Günther.

3. Leptocephalus ceramensis Blkr.

Leptocephalus ceramensis Bleeker, Atl. Ichth. IV. 1864, p. 123.
Leptocephalus ceramensis Günther, Cat. Brit. Mus. VIII. 1870, p. 143.

Described after a specimen of 212 mm. which was in a bad state, from Wahai, Ceram.

4. Leptocephalus taenioides Blkr.

Leptocephalus taenioides Bleeker, Atl. Ichth. IV. 1864, p. 123.
Leptocephalus taenioides Günther, Cat. Brit. Mus. VIII. 1870, p. 142.
Leptocephalus taenioides Max Weber, Siboga-Exp. Fische, 1913, p. 66.

Described after a specimen of 105 mm. from Ambon.

5. Leptocephalus hypselosoma (Blkr.).

Leptocephalichthys hypselosoma Bleeker, Act. Soc. Sc. Indo-Neerl. I. 1856, Beschrijving vissch. Menado, p. 69.
Leptocephalus hypselosoma Bleeker, Atl. Ichth. IV. 1864, p. 124. — Günther, Cat. Brit. Mus. VIII. 1870, p. 140. — Max Weber, Siboga-Exp. Fische, 1913, p. 66.

Described after a specimen of 84 mm. from Celebes (Menado); from brackish water.

6. **Leptocephalus javanicus** Strömman.

Leptocephalus javanicus Strömman, Leptocephalids in the University Zoolog. Museum of Upsala. Dissertat. Upsala, 1896, p. 30 [1]).

"The body is strongly compressed, moderately elongate and low; its greatest height, contained about eleven times in its length is situated rather behind the middle. It gradually diminishes in height from that point towards both head and tail in approximately equal degrees.

The head is elongate; its length is equal to the body's greatest height. Its upper profile is in the form of a regular shallow arch. The snout is pointed. The space from the snout-extremity to the eye's anterior margin is about three times as great as the diameter of the eye.

The eye has a circular contour; its upper margin does not reach up to the upper profile of the head.

The posterior nostril is situated a little in front of the eye. The anterior is distant from the snout-extremity four times as far as from the posterior nostril. The cleft of the mouth is horizontal, reaching back to the middle of the lower margin of the eye.

The mandible projects a little beyond the upper jaw; its lower profile is straight, retreating with a slightly prominent angle. Teeth in both jaws. Pectoral fins none. The vertical fins show but slight development; the dorsal fin has its origin a little in front of the vent; the caudal fin is pointed.

The vent is in front of the body's middle, approximately at one third of the length from the fore part.

There are some series of closely packed pigmentary spots grouped along the sides of the body immediately above the alimentary canal. There are moreover a few scattered ones on the head in the region of the gillopenings and the snout-extremity.

In the collection there is one example of this species, obtained by CAPTAIN VON SCHÉELE in 1885 in the Bali Straits. Its measurements are als follows:

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1) As STRÖMMAN's publication is rather rare, we thought it convenient for those who use our book, to reprint his description.

Length of body	44	mm.
Greatest height of body	4	„
Distance from extremity of snout to dorsal fin	13	„
Distance from extremity of snout to vent	16	„
Length of head	4	„
Distance from extremity of snout to eye's anterior margin	1.5	„
Eye's diameter	0.5	„

Order SYNBRANCHOIDEA.

Body anguilliform. Scales absent or minute, longitudinally arranged. Lateral line present. Skull long, the supraoccipital separated from the frontals by the parietals, which are meeting [not in *Alabes*]. Mouth not protractile, bordered above mainly by the intermaxillaries; the maxillaries lying behind and parallel to them. Opercular bones normal. Anterior vertebrae not modified, no Weberian ossicles. Pectorals absent, only the membrane bones of their arch are developed. Ventrals absent, only in *Alabes* Cuv. present as jugular rudiments. Dorsal and anal rayless folds of the skin, united with the small caudal, which has a few rays. Teeth in bands or in series on jaws and generally on palatines and pterygoids. Gillmembranes confluent, free from isthmus or united with it and accordingly forming a single aperture pierced under the throat and common to both sides or this aperture is only superficially a single one.

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1. Fam. SYNBRANCHIDAE.

Elongate. No scales. Anus in posterior half of the length. Ventrals absent. Gills on three or four branchial arches, well developed or rudimentary.

Distribution: Indo-australian Archipelago, Dampier Archipelago, Philippines, Japan, Asiatic continent from Indian Peninsula to Northern China, tropical parts of West Africa and Central and South America.

Key to the genera of *Synbranchidae*.

I. Gillmembranes confluent and attached to isthmus by a median septum which divides the gillopening. Gills on three arches, rudimentary. Teeth in bands . . . . . *Monopterus* p. 412.

II. Gillmembranes confluent, free from isthmus; gillopening undivided. Gills on four arches, well developed. Teeth in single series, which are only pluriserial near their anterior end.

1. Gillopening wide, extending up the sides to lateral line. *Macrotrema* p. 414.
2. Gillopening narrow, restricted to ventral surface . . *Synbranchus* p. 415.

1. Monopterus Lacépède.

(Lacépède, Hist. nat. Poissons II. 1798, p. 139).

Body naked; elongate, cylindrical posteriorly compressed, tail short, narrow, tapering into a point. Lateral line present. Lips well developed, forming a rather broad fold, the lower one reverted over the lower jaw. Posterior nostrils an oval opening above anterior part of eye, anterior nostrils smaller openings near end of snout in upper lip. Eye small, covered by skin. Dorsal and anal low, rayless folds of the skin, confluent with small caudal, which has a few rays. Pectorals and ventrals absent. Teeth small, in bands on intermaxillaries, palatines, pterygoids and mandibles. Gillmembranes confluent and nearly entirely united with the isthmus; the gillopenings nearly transverse ventral slits, only superficially confluent into a single aperture. Four branchial arches, the three anterior with vestigial gills [1]) and with three moderate slits between them.

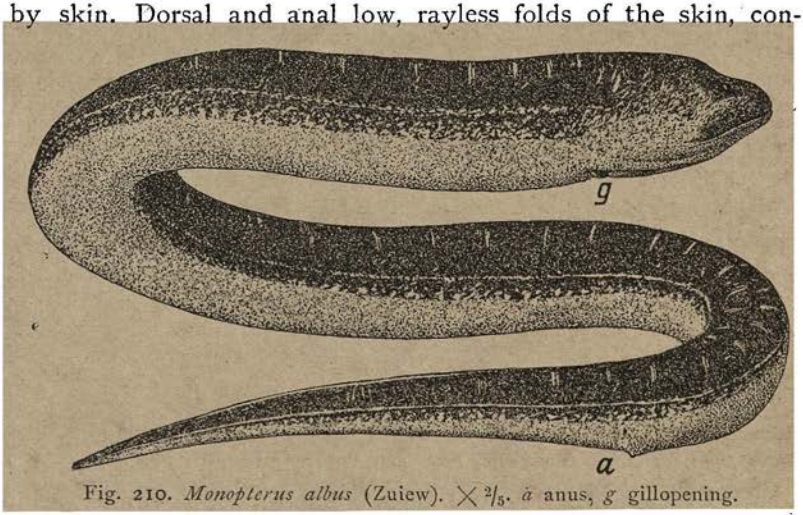

Fig. 210. *Monopterus albus* (Zuiew). × 2/5. *a* anus, *g* gillopening.

Distribution: that of the single species.

1) For the mode of respiration of this fish see Volz, Zool. Jahrb. Abt. Anatomie XXIII. 1906, p. 163.

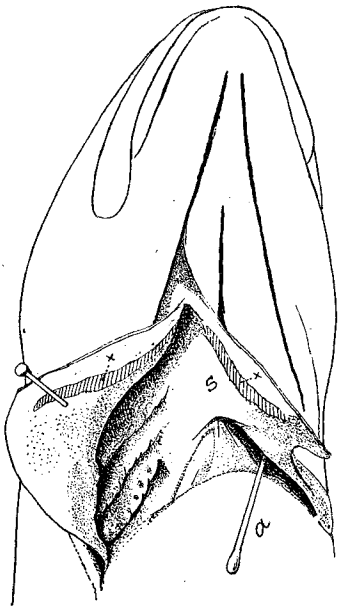

Fig. 211. Lower surface of head of *Monopterus albus* (Zuiew). Right gillopening opened, showing the 3 rudimentary gills and the 3 gillslits. *a* sound brought into the left gillopening, which is separated from the right one by the septum *s*. ×× indicates where the left part of the constrictor of the gillmembranes is cut through. Nat. size.

1. Monopterus albus (Zuiew).

Muraena alba Zuiew, Nov. Act. Ac. Sc. Petropol. VII. 1793, p. 299.
Monopterus javanensis Lacépède, Hist. nat. Poissons II. 1798, p. 139.
Unibranchapertura laevis Lacépède, l. c. V. 1803, p. 657, 659.
Monopterus javanicus Shaw, General Zoology, Pisces IV. 1804, p. 33.
Monopterus laevis Richardson, Voy. Sulphur, Ichth. 1844, p. 116.
Monopterus cinereus Richardson, l. c. p. 117.
Monopterus? *vel Synbranchus*? *xanthogaster* Richardson, l. c. p. 118.
Monopterus laevis Richardson, in Rep. 15th Meeting British Assoc. London, 1846, p. 315.
Monopterus cinereus Richardson, l. c. p. 315.
Monopterus marmoratus Richardson, l. c. p. 315.
Monopterus javanicus Bleeker, Verh. Batav. Gen. XXIII. 1850, Ichth. Midden-en Oost-Java, p. 22.
Monopterus javanicus Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 1321.
Monopterus javanensis Bleeker, Verh. Batav. Gen. XXV. 1853, Muraenoid. p. 59 [1]).

1) Bleeker cites as synonym *Synbranchus eurychasma* Kuhl & van Hasselt, after an unedited drawing of these naturalists without a description.

Monopterus javanicus Kaup, Cat. Apod. fish, 1856, p. 123.
Monopterus javanensis Bleeker, Atl. Ichth. IV. 1864, p. 118.
Monopterus javanensis Günther, Cat. Brit. Mus. VIII. 1870, p. 14.
Monopterus javanensis Day, Fishes of India 4°. 1878—1888, p. 656.
Monopterus albus Jordan & Snyder, Proc. U. S. Nat. Mus. XXIII. 1901, p. 838.
Cryptophthalmus robustus Franz, Abh. Bayer. Akad. München 4. Suppl. Bd. 1910, p. 15.

Height 17—26; head 10—13, $7^1/_2$ or more in trunk. Tail $2^1/_2$ to nearly 3 times in head and trunk. Eye about 13 in large specimens, about 2.5 in length of snout, situated above middle of maxillary. Cleft of mouth 2.4 to 2.7 in length of head. Origin of dorsal somewhat behind vent. Upper surface of preserved specimens brownish or greyish above, yellowish or whitish below. Length 875 mm.

Nomen indig.: Belut (Sundan.); Welut (Javan.); Lindung (Malay.).

Habitat: All over Sumatra, Borneo, Java in fresh water of rivers, brooks, rice ditches, ponds, lakes. We have also specimens from heights of 3000 feet (Mount Pangerango near Sukabumi, Java); Lombok (Ampenan, Lake Narmade); Sumbawa; Banka; Bintang; Natuna Islands; Celebes (Lake Sidenreng!, Pampanuwa, Makassar); Wahai (Ceram). — Asiatic continent from Malacca, Burma and Siam to Northern China; Chinese Islands; Formosa and Japan.

This fish is capable of living a considerable time out of water and of burying itself in the mud when the water is drying up.

2. **Macrotrema** Regan.

(C. Tate Regan, Ann. Mag. Nat. Hist. (8) IX. 1912, p. 390).

Body naked, elongate, cylindrical; the tail greatly compressed, short and tapering. Lateral line present. Lips well developed, the lower one reverted over the lower jaw. Posterior nostrils lanceolate openings, situated obliquely above the eye; anterior nostrils, which are smaller and have a raised margin, near tip of snout. Eye minute, covered by skin. Dorsal and anal low, rayless folds of the skin, confluent with the small caudal, which has 10 rays. Pectorals and ventrals absent. The setaceous teeth, which form a single series on the intermaxillaries, become crowded and form a triangular figure near the symphysis. The palatal teeth are obtusely conical and stronger and placed in a single arched series. Those of the lower jaw

are still stronger, their single series is expanded near the symphysis into a semilunar band of three or four series. Gill-membranes united, free from isthmus. Gillopenings forming a

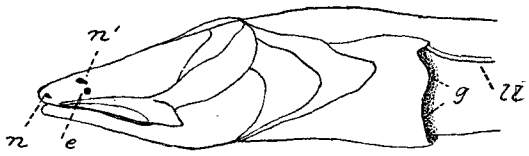

Fig. 212. Head of *Macrotrema caligans* (Cant.). (After CANTOR).
e eye; *g* gillopening; *ll* linea lateralis; *n* anterior, *n'* posterior nostril.

single aperture, which is very wide and extends up the sides to the lateral line. Four branchial arches, all with well developed gills.

Distribution: that of the single species.

1. **Macrotrema caligans** (Cant.).

Symbranchus caligans Cantor, Journ. Asiat. Soc. Bengal XVIII. 1850, p. 1316.
Ophisternon caligans Bleeker, Act. Soc. Sc. Indo-Neerl. VI. 1859, p. 180.
Synbranchus caligans Bleeker, Atl. Ichth. IV. 1864, p. 119.
Symbranchus caligans Günther, Cat. Brit. Mus. VIII. 1870, p. 17.
Symbranchus caligans von Martens, Preussische Exp. nach Ost-Asien, Zool. Theil I. 1876, p. 405.
Macrotrema caligans Tate Regan, Ann. Mag. Nat. Hist. (8) IX. 1912, p. 390.

Height at occiput $3^1/_2$ times in length of head, at the anus $4^1/_2$ times. Head $8^1/_2$ to $8^3/_4$. Tail 4 to 5 in head and trunk. Eye minute, nearly opposite to the middle of lip. The dorsal commences opposite to anus, but is not distinct on the anterior third of the tail. The anal resembles the dorsal. Head above and back impure lake-coloured with livid reflections, lighter on the sides and abdomen; throat pale livid; dorsal, anal and caudal pale carmine. Length 200 mm. [After CANTOR; not seen by us].

Nomen indig.: Balut (Malay.).

Habitat: Singapore. — Pinang.

In sea.

3. **Synbranchus** Bloch.

(BLOCH, Ausländ. Fische IX. 1795, p. 87).

Body naked, elongate, cylindrical; the tail greatly compressed, short and tapering. Lateral line present. Lips well developed, the lower one reverted over the lower jaw. Posterior nostrils

oval openings, situated above eye; anterior nostrils minute openings on tip of snout. Eye small, covered by skin. Dorsal and anal rayless folds of skin, confluent with the small caudal, which has 8—10 rays. Pectorals and ventrals absent. Intermaxillary teeth small, in a single series, which is near symphysis triangularly expanded into about three series of somewhat stronger teeth. Teeth on palatines and pterygoids stouter, conical, forming a single arched series, anteriorly, near symphysis, expanded as the intermaxillary teeth, which they equal in size. Mandibulary teeth still stronger, arranged in a single series, which broadens near symphysis into a pluriserial triangular figure. Gillmembranes united, free from isthmus. Gillopenings forming a single semi-oval, rather narrow opening, which is situated ventrally and does not extend to the sides. Four branchial arches, all with well developed gills.

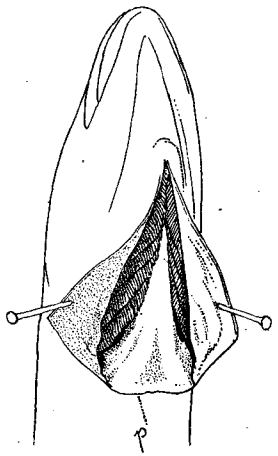

Fig. 213. Lower surface of head of *Synbranchus bengalensis* (Mc Clelland). The branchial chamber is opened, showing the 4 branchial arches with well developed gills; *p* margin separating the ventral skin from the branchial chamber. Nat. size.

Distribution: Indo-australian Archipelago, Dampier Archipelago; South eastern Asia, Philippines, tropical parts of West Africa and Central and South America.

In fresh and brackish water.

1. Synbranchus bengalensis (Mc Clell.).

Synbranchus immaculatus Bloch, Ausländ. Fische IX. 1795, p. 87 (p. p.).
Symbranchus immaculatus J. Müller, Abh. Akad. Wiss. Berlin 1839, p. 245 (ex parte).
Ophisternon bengalensis Mc Clelland, Calcutta Journ. Nat. Hist. V. 1845, p. 197.
Symbranchus gutturalis Richardson, Zoology Voyage Erebus & Terror, 1845, p. 49.
Symbranchus immaculatus Cantor, Journ. Asiat. Soc. Bengal, XVIII. 1850, p. 1319.
Tetrabranchus microphthalmus Bleeker, Nat. Tijdschr. Ned. Indië II. 1851, p. 69.
Symbranchus immaculatus Bleeker, Verh. Bat. Gen. XXV. 1853, Muraenoid. p. 57 (nec Bloch).
Ophisternon bengalensis Kaup, Cat. Apodal Fish 1856, p. 121.
Ophisternon bengalensis Bleeker, Act. Soc. Sc. Indo-Neerl. VI. 1859, Enum. Pisc. Arch. Ind. p. 179.
Synbranchus bengalensis Bleeker, Atl. Ichth. IV. 1864, p. 119.
Symbranchus bengalensis Günther, Cat. Brit. Mus. VIII. 1870, p. 16.

Symbranchus bengalensis Day, Fishes of India 4°. 1878—1888, p. 657.
Symbranchus bengalensis Max Weber, Zool. Ergebn. Reise Niederl. Ost-Indien Heft 2, 1894, p. 428.
Symbranchus bengalensis Volz, Revue Suisse Zool. XII. 1904, p. 481.
Symbranchus bengalensis Regan, Trans. Zool. Soc. London, XX. Prt. 6, 1914, p. 275.

Height 27—30; head 10.5 to more than 11; 8 times in trunk. Tail nearly 4 times in head and trunk. Eye 20 or more, situated above anterior third of cleft of mouth, which goes about 4 times in head. Origin of dorsal somewhat before anus. Dark brown, somewhat lighter below. Length 530 mm.

Nomen indig.: Putjuk-Kirai (Bantam).

Habitat: Sumatra (Lake Tador, Upper Langkat); Java (Batavia, Perdana); Borneo (Banjermasin); Celebes (Makassar, Palima at mouth of river Tjinrana!); New Guinea (Mimika river!). — Dampier Archipelago, Philippines, Cochin, Siam, Peninsula of India.

In fresh and brackish water.

ADDENDA AND CORRIGENDA.

p. 17. "*Homaloptera belineata*" in Note must be read "*Homaloptera bilineata*".

p. 27. "*Eucirrhichtys doriae*" Perugia must be read "*Eucirrhichthys*".

p. 31. "*Acanthophtalmus pangia*" must be read "*Acanthophthalmus*;" also in the 1st and 10th line of synonymy.

p. 275. On this page is omitted the following figure:

Muraenichthys gymnopterus (Blkr.) × 2 1/2.

In volume II:

p. 54. The key on top of page must be read:

A. Ventral fins present . . . . *Pellona* p. 84.

B. Ventral fins wanting.

1. Dorsal present. . . . . *Opisthopterus* p. 95.
2. Dorsal wanting. . . . . *Raconda* p. 97.

p. 81. The last word in last line on bottom is to be altered in "indentated".

p. 158. *Myctophum pterotum* (Alcock). add: Fish market at Pulu Weh!.

p. 166. *Myctophum dumerili* (Blkr.) add: Fish market at Pulu Weh!.

p. 193. In the 10th and 11th line from top: "nearly reaching ventrals" must be read: "nearly reaching pectorals".

p. 194. The first line of the page must be cancelled.

p. 311. Line 18 and 19 from top must be read: "Eye 4—5 1/3, with a free orbital margin, 2 1/5 or more in postorbital part of head, about twice or thrice in the interorbital space . . . ."

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1) As in Java the three languages: javanese, sundanese and malay are spoken, we have accordingly placed behind the indigenous names (Malay.), (Sundan.) or (Javan.). In naming a fish the malay people use as a rule "ikan" = fish before the special name. In most cases we have omitted "ikan".

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